

## NATIONAL SCIENCE FOUNDATION (NSF)

Advisory Committee for Polar Programs (AC-OPP)  
Spring Meeting, April 29-30, 2021  
Meeting Held Online

### MINUTES

#### Action Items Arising out of the Spring 2021 AC-OPP Meeting

1. Items arose for possible inclusion in the agenda of the next AC-OPP meeting (fall 2021):
  - a) Rebecca Keiser, Chief of Research Security Strategy and Policy, to possibly meet with the committee.
    - a. Presentation on the security of Federally funded research while maintaining dynamic international collaborations.
    - b. Briefing on NSF cybersecurity.
    - c. Presentation on resilience for U.S. scientists with projects in Russia
  - b) Presentation on Antarctic research vessel activity.
  - c) Joint session between AC-OPP and ACCI.
    - a. Update on OAC activities being carried out in coordination with Polar.
  - d) Further discussion of helping OPP and the research community with added workload due to COVID-19.
    - a. Presentation of results of the COVID-19 impacts survey stemming from SBE RAPID Award # 2030013
  - e) Discussion of OPP organizational structure.
  - f) Presentation from NSF's specialized Program Officers who work with community colleges re underrepresented groups.

#### Attendance and Membership

AC-OPP Members Present:

Dr. Thomas J. Weingartner, College of Fisheries and Ocean Sciences, Institute of Marine Science (Ret), Chair, AC-OPP

Mr. Raymond V. Arnaudo, Department of State (Ret), member, Advisory Committee, Environmental Research & Education

Dr. Douglas H. Bartlett, Scripps Institution of Oceanography, University of California, San Diego

Dr. Aron L. Crowell, University of Alaska, Anchorage

Dr. Michael D. DeGrandpre, Department of Chemistry and Biochemistry, University of Montana, Missoula

Dr. Ryan E. Emanuel, Department of Forestry and Environmental Resources, North Carolina State University

Dr. Patrick Heimbach, Institute for Computational Engineering and Sciences, The University of Texas at Austin

Dr. Allyson Hindle, University of Nevada, Las Vegas, School of Life Sciences  
Mr. Steve Iselin, U.S. Navy (Ret), Iselin Consulting Enterprise, LLC  
Dr. Vera Kuklina, Department of Geography, George Washington University  
Dr. Brice Loose, University of Rhode Island, Graduate School of Oceanography  
Dr. Amanda Lynch, Institute at Brown for Environment and Society, Brown University,  
Providence, RI  
Dr. Michelle Mack, Center for Ecosystem Science and Society and the Department of Biological  
Sciences, Northern Arizona University  
Dr. Adam Marsh, School of Marine Science, University of Delaware  
Dr. Meredith Nettles, Lamont-Doherty Earth Observatory, Columbia University  
Dr. Patricia Quinn, Pacific Marine Environmental Laboratory, National Oceanic and  
Atmospheric Administration (NOAA)  
Dr. Sharon Stammerjohn, Institute of Arctic and Alpine Research, University of Colorado  
Dr. Eric Steig, Earth and Space Sciences, College of the Environment, University of Washington  
Dr. Abigail Vieregg, Kavli Institute of Cosmological Physics, Eckhardt Research Centers,  
University of Chicago, IL

Office of Polar Programs and other NSF staff (presenters and speakers):

Dr. Kelly K. Falkner, Director, OPP  
Dr. Scott Arnold, Senior Advisor, OPP  
Dr. Greg Anderson, Program Director, Arctic System Sciences, OPP  
Ms. Renée Crain, Research Support & Logistics Manager, OPP  
Dr. F. Fleming Crim, NSF Chief Operating Officer  
Dr. William Easterling, Assistant Director, GEO  
Dr. Linda Hayden, Director, Center of Excellence in Remote Sensing Education and Research  
(CERSER).  
Dr. Erica Hill, Program Director, Arctic Social Sciences  
Dr. Gretchen Hofmann, Professor, University of California at Santa Barbara.  
Dr. Alexandra Isern, Acting Assistant Director, GEO  
Dr. Michael Jackson, Program Director, Research Facilities and Special Projects, ANT, OPP  
Ms. Melissa Lane, Staff Associate for Information Management, GEO  
Dr. Jennifer Mercer, Arctic Research Support and Logistics Manager, OPP  
Dr. Sethuraman “Panch” Panchanathan, NSF Director  
Dr. Allen Pope, Program Director, Polar Cyberinfrastructure  
Ms. Elizabeth Rom, Program Director, OPP/OCE  
Dr. Mike Sfraga, Woodrow Wilson Center  
Ms. Stephanie Short, Section Head, AIL, OPP  
Dr. Marc Stieglitz, Program Director, Arctic Natural Sciences, OPP  
Dr. Colleen Strawhacker, Program Director, Arctic Sciences, OPP  
Mr. Brian Stone, Chief of Staff, Office of the Director (OD)  
Ms. Beverly J. Walker, Science Analyst, OPP

**Thursday, April 29**

Welcome and Introductions; Conflict of Interest (COI) Review

Dr. Weingartner; Dr. Falkner; Dr. Crain

The meeting began with Dr. Falkner thanking everyone for attending and expressing her hope to resume face-to-face meetings in the near future. The committee turned next to the COI review. Dr. Renée Crain said the advisory committee is subject to the Federal Advisory Committee Act (FACA) and highlighted relevant elements.

#### Office of Polar Program Updates

Dr. Falkner; OPP Staff

Dr. Falkner discussed the following staffing changes:

#### New Hires

- Paul Sheppard — Office of Polar Programs, Executive Officer
- Sara Eckert — Office of Polar Programs, Communications Specialist
- Tamika Perkins — Antarctic Infrastructure & Logistics Section, USAP Business Manager
- Kimberly Ohnemus — Office of Polar Programs, John A. Knauss Marine Policy Fellow

#### Acting

- Michael Jackson — Antarctic Sciences Section, Acting Section Head
- Jennifer Mercer — Arctic Sciences Section, Acting Section Head

#### Details

- Robert Moore (Intergovernmental Personnel Act (IPA)) — Antarctic Sciences Section, Acting Geospace Section Head, GEO/Division of Atmospheric and Geospace Sciences (AGS)
- Angela Lyons — Antarctic Sciences Section, Program Specialist, Directorate for Mathematical and Physical Sciences (MPS)/ Division of Chemistry (CHE)

#### Retired

- Simon Stephenson — Arctic Sciences Section, Section Head

#### Departures

- Alex Isern — Antarctic Sciences Section, Section Head
- Brian MacDonald — Antarctic Infrastructure & Logistics Section, Capital Planning Manager
- Yekaterina “Katia” Kontar — Arctic Sciences Section, The American Association for the Advancement of Science (AAAS) Science and Technology (S&T) Policy Fellow

Dr. Arnold continued with a presentation of publicly available budget information at the agency level for FY20 Actuals and FY21 Enacted.

Dr. Falkner resumed the presentation, following connection difficulties. She discussed:

- [U.S. Antarctic Program develops Sexual Assault/Harassment Prevention and Response \(SAHPR\) Program](#)
- [Arctic Community Engagement \(ACE\) web pages](#)
- New Pier to be Constructed in 2021-2022 at Palmer Station, Antarctica
  - [Dear Colleague Letter \(DCL\)](#)
  - [Frequently Asked Questions \(FAQs\)](#)

- [New solicitation: Office of Polar Programs Postdoctoral Research Fellowships \(OPP-PRF\)](#)
- [Request For Information \(RFI\): Science, Technology, Engineering, Arts, and Mathematics \(STEAM\) at the Poles](#)
- [Updated Antarctic Sciences solicitation](#)
- [New Dear Colleague Letter: Supporting Data and Sample Reuse in Polar Research](#)
- [Virtual Industry Day for Operations and Science Support to the United States Antarctic Program](#)

### *Discussion*

In response to a question from Dr. Lynch about the timeline for the budget, Dr. Arnold said the 2022 request is being developed. It will be finished in the next couple months.

Dr. Nettles noted that Dr. Falkner will be moving out of her role, where she has provided terrific leadership for almost a decade and asked about the timeline. Dr. Falkner said she will be stepping aside as of August 1, when she will move to the Office of Science and Technology Cooperation (STC) in the Department of State's Bureau of Oceans and International Environmental and Scientific Affairs (OES). Dr. Nettles asked Dr. Weingartner for time to appreciate as a committee the service Dr. Falkner has provided.

Dr. Loose asked about the \$600 million allocated to NSF through the rescue plan at the beginning of the year and how those funds are being used. Dr. Arnold said the funds will be targeted towards individuals and institutions disproportionately impacted by COVID-19. Dr. Falkner added that the AC had expressed strong concerns about younger people and the disproportionate impact on minorities due to COVID-19, which influenced the allocation Dr. Arnold mentioned.

Dr. Loose said NSF funded an assessment of COVID impacts and asked about getting the results. Dr. Falkner said staff would research it and get back to him. Many NSF units have funded a variety of things around this topic.

Dr. Heimbach asked about women's career paths having been disproportionately impacted by COVID-19. He suggested bringing it up when the AC meets with the NSF director, Dr. Panchanathan. Dr. Falkner said it has been actively under discussion at all levels and the Director is committed to addressing the equity issue, which COVID-19 has exacerbated.

Dr. Bartlett asked for more information on the OPP document referenced earlier regarding sexual harassment. Dr. Falkner said an award was made to help set up a U.S. Antarctic Program (USAP) [Sexual Assault/Harassment Prevention and Response \(SAHPR\) program](#). The agency is looking carefully at whether changes in policy are needed to ensure safety in the field to include this sort of issue. There is a code of conduct for both poles that people already have to sign. NSF does not tolerate harassment of any kind, but there is an effort to make policies and practices ever more robust. Part of need is cultural change. Communities, for example, in Antarctica, have lingering concerns about how equitable and inclusive field location are and if NSF is doing the right thing if information suggests there could be problems.

Dr. Nettles raised the issue of managing risks and suggested it would be good for the committee to hear about it. Dr. Renée Crain spoke in response about efforts to engage the research community in workshops around risk management in the field, including an Arctic-based one in 2014 that covered field safety and risk management, with guest speakers and active discussions. There are differences between the Arctic and the Antarctic. There is consideration of having virtual mini workshops to get a small group together around a focused issue and reporting out to a larger workshop to be held in the future. COVID-19 has thrown off scheduling the larger meeting, but there are plans to meet in June and discuss working in and travelling through crevasse zones and engage mountaineers and researchers and other stakeholders to talk about satellite imagery and how that can be used to manage risk. This also came up in the context of field safety as it pertains to harassment and bullying and sexual harassment and how to inoculate field teams against those kinds of behaviors and to report incidents. In 10 months to a year there will be a bigger Arctic and Antarctic field safety risk management workshop, possibly in person. She added that there are regular check-ins with the contractor to look at incidents for patterns.

Dr. Falkner addressed the update on the Antarctic research vessel, stating that it would be a week or two before being able to publicly discuss that issue. But there has been active work on the subject.

Dr. Mack asked about work in Russia and how, after the pandemic, US science can be recovered, particularly in terrestrial Russia, and how to repair or re-envision some of the collaborative relationships. She asked if when thinking about the types of working groups or committees bringing together U.S. researchers with an interest in Russian terrestrial ecosystems there could be a place for envisioning what's going to happen after the pandemic and how to move forward as a group in a positive and proactive way.

Dr. Falkner said if you look at a map of the Arctic and don't consider Russia, you're missing a substantial fraction. It would be impossible to consider it at a system or other level without including Russia. It is a tense time for political reasons. OPP will have to figure out how to effectively involve the AC in that topic. NSF has an Office of International Science & Engineering that tends to handle such matters, in conjunction with the State Department. And there has been varying guidance as to how engaged people can be. Typically, education and science exchanges continue despite political tensions; they form the basis of the civil society that can get us through those tense times. She expressed hope for continuing the favorable collaborative efforts undertaken in Russia.

Dr. Kuklina asked about the Navigating the New Arctic (NNA) community office, noting it was not clear what questions could be addressed to them and what questions should be for program officers (PO). Dr. Anderson said if it's about a programmatic question about a proposal or an award or a budget, talk to your PO. If it's an idea for a project, talking with us as program officers is the way to go. The Community Office is where people can come together to get information they need or to communicate with each other about general research ideas/synergies and how people can work together to coordinate information sharing. While the NNA community office is not solely geared to assist with indigenous communities and local residents engagement in the Arctic, they can help with that

Dr. Falkner added that you can reach out to the PO and if they think the community office would be a good resource, they will tell you that.

Mr. Arnaudo returned to the question of Russia and noted the Russians are assuming the Arctic Council chairmanship this spring. He suggested inviting someone from State to speak to the next AC meeting. Dr. Falkner added there is also the Arctic Science Ministerial in May. The Office of Science and Technology Policy (OSTP) will have the head of delegation role and may be willing to speak to the AC on these matters as well.

### COVID-19 Impact Updates

Ms. Short; Dr. Mercer; Dr. Jackson; Mr. Iselin

Dr. Mercer showed a graph representing Arctic COVID-19 impacts in 2021 on science project cancellations and delays. About 139 projects went into the field in 2019. In 2020, about 48 projects went into the field and 83 were postponed until at least 2021. Another 42 were able to have work done remotely. For 2021, the numbers change frequently. As of this day, 120 projects are planning to go into the field. So far, 22 have been postponed until at least next year; that number is expected to rise. And 19 projects have made arrangements for remote work to be done without project team deployment.

Regarding travel restrictions in Alaska, all project participants are encouraged to become familiar with and follow Federal, State, local and tribal regulations and guidelines. Researchers are required to obtain informed consent from any remote communities that will be impacted. Utqiagvik now requires 10-day quarantines. Greenland is closed to incoming travelers. NSF is negotiating entry on a flight-by-flight basis. All travelers are required to travel via Air National Guard from New York and undergo a multi-test, double-quarantine process. At this time, travel to other villages is not permitted. NSF has established a COVID polymerase chain reaction (PCR) test lab in Kangerlussuaq. Vessels are dependent on vessel and port of embarkation, e.g., a 14-day quarantine and two tests are required before boarding Sikuliaq. Dr. Mercer also said international travel is dependent on country entry/exit allowances and vaccines do not change the travel protocols.

For 2020, everything was basically shut down, though Summit Station was maintained throughout the year. And the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) was completed. For 2021, more field projects deployed to Alaska and Greenland. The Greenland season started at the beginning of March to accommodate the Air National Guard (ANG) 109th flight crew training and recertification. Also, field project time is reduced if positive COVID tests are encountered, affecting the whole team, so all participants must remain flexible.

Turning to the impact on facilities, Dr. Mercer said they have been heavily impacted. In Alaska:

- Toolik Field Station capacity capped at 120
- UIC in Utqiagvik is providing separate isolation quarters for NSF researchers

In Greenland:

- Additional housing has been acquired in Kangerlussuaq to accommodate isolations
- Summit Station is considered clean, no restriction of movement upon arrival
- Summit infrastructure heavily impacted by snow accumulation
- All construction has been deferred until 2022, impacting reconstruction at Summit Station.

There has been regular communication with the research community and all the people who work in programs across the Arctic, including office hours, which attracted about 100 people for each of the two events. In addition, the support contractor, Battelle Arctic Research Operators (ARO), is holding live Q&A sessions prior to each flight period heading to Greenland. They also hold regular meetings with individual groups heading to Alaska to discuss their travel plans. Also, POs throughout the Arctic section and contractors have been communicating with all the research groups on individual bases regularly throughout the last year. She also pointed to announcements on the OPP website: an updated [COVID impacts page](#) for Arctic field work and a [Dear Colleague Letter](#) supporting proposals for data and sample reuse in Polar Research.

Dr. Jackson continued the presentation by recognizing that last year was difficult for the Antarctic program and acknowledging the continued perseverance by the science community and NSF staff in the face of unprecedented challenges. He is encouraged, he said, that the community has continued doing important scientific work, including supporting graduate students, undergraduate students and postdocs. It has especially affected underrepresented groups, students, early career faculty and those with young families. He said science Program Directors are working tirelessly to move the program through these tough times. Last year, more than 600 people were safely deployed, most through New Zealand and the essential worker exemptions to the closed border rules. Some deployers spent more than 40 days in isolation. There was no indication the coronavirus reached any stations, critical operational activities were completed and science continued in these challenging circumstances.

He also spoke about behind the scenes support work. In advance of the deployments, the medical team deployed testing machines and test kits to stations and gateways and procured and shipped thousands of pieces of protective equipment and established a six-bed isolation unit at the marine station for use in the event of a suspected case of the virus. Small aircraft were used, requiring multiple stops. A major unexpected challenge for the season was the failure of the ice pier due to weather and environmental conditions. An early warning allowed the shift to an air bridge resupply, which was successfully completed. The stations were supplied and operational objectives were met, including repair and replacement of utility and fire systems, delivery of fuel to the South Pole and crew turnovers.

Included among the deployers were 70 science and science support staff focused on projects where a break in a critical time series or data set would jeopardize the ability to test hypotheses, or where instrumentation would be lost. There were 20 science events that were supported this year. Dr. Jackson also discussed excavation and servicing of the Lower Thwaites Glacier Polar Earth Observing Network (POLENET) project and servicing the TIME passive seismic site. Instrumentation supporting the Comprehensive Test Ban Treaty and the Joint Polar Satellite System (JPSS) ground stations.

South Pole Station instrumentation at the Background Imaging of Cosmic Extragalactic Polarization (BICEP) array and IceCube Neutrino Observatory and Atmospheric Research Observatory were operated and maintained. Also, more than two dozen additional science project events with equipment monitoring, troubleshooting and data retrieval were supported.

Dr. Jackson said several factors, including travel advisories and virus variants, indicate limited activities for the 2021-2022 field season. The focus is on keeping the station safe and within continuous operation mode and resupplying for winter. There will be a focus on activities needed to minimize irreversible impacts on science, construction and future operations. He hopes there can be an increase in the number of science deployers over last year's totals, though it will be well below the number in a normal season. There are plans to have cargo and fuel vessels at McMurdo Station but there will be no major construction there. The Palmer Pier, however, will be replaced. There will not be support for any on-station scientific personnel at Palmer. Instruments installed at or near the station will continue to operate.

There will be a continuation of off-ice assistance through the use of no cost extensions, budget reallocation and judicious use of supplements and highlighting opportunities for data and sample reuse and a new OPP postdoc solicitation and periodic Antarctic office hours. Work with the community will continue on NSF-wide initiatives that may ease the burden of the impacts of COVID-19 on the community.

Dr. Jackson ended by recognizing the phenomenal job both the Arctic and the Antarctic science program directors and the Antarctic logistics staff did this year interfacing with the community through many difficult conversations.

### *Discussion*

Dr. Flanner asked for more information on the situation of the ice pier at McMurdo. Dr. Jackson said it could not be reestablished last season due to environmental conditions, including melting sea ice conditions.

Mr. Iselin asked about submission deadlines and the postdoc funding. Dr. Jackson said on the data reuse DCL there is no due date. It is a way of continuing to pursue funding that doesn't necessarily involve fieldwork. Regarding the postdoc, it is an opportunity for postdocs to write their own proposals and get their own funding. Funding can also be put into proposals that are being submitted to the Foundation.

Dr. Nettles raised the impact on those managing this process who are working double and triple time. That's a big impact that can't go on forever and it will take time to recover. She expressed hope that everyone try to take into account that impact on program staff and researchers.

Dr. Falkner appreciated the comment, adding that she is amazed at how people have stepped up to the plate and continue to press forward. It's a heavy load and that was recognized within NSF by the NSF Director, Dr. Panchanathan, who thanked everyone in person for their efforts and expressed his gratitude and spoke to each one of the people in Polar Programs. Everyone needs to work together to get through this, she said. Dr. Vieregg seconded the comment from Dr.



Nettles. It is extremely impressive that anything is happening, let alone the high fraction of science that is happening, she said.

Dr. Weingartner asked if there were any cases of COVID in the Arctic. Dr. Mercer said there has been a twofold goal for the Arctic, to work with the research groups to achieve their original objectives, whether on a delayed timescale or through other means, and not vectoring COVID into the Arctic, which has been a success. COVID does exist in the Arctic, but not because of NSF operations. The Arctic is made up of countries that have all experienced cases of COVID. Greenland has had around 30 cases and no deaths. In Alaska there have been a lot of cases of COVID and also recently in northern Canada. The northern Canadian villages are undergoing some outbreaks currently as well. There have been positive tests stateside before people have deployed and those people aren't allowed to deploy. Because of isolation and quarantine procedures, as long as they haven't interacted with anyone else, that doesn't affect the whole group going. But if it's a critical person on a team, or in some recent cases on military flight crew teams, then it causes some significant delays.

#### Prepare for the meeting with the NSF Director & Chief Operating Officer

Dr. Weingartner; Dr. Falkner

Dr. Weingartner led the AC through the process of preparing high points to present to the NSF Director during his upcoming appearance before the committee.

#### Meeting with the NSF Director & Chief Operating Officer

Dr. Panchanathan; Dr. Crim; Dr. Weingartner

Dr. Falkner welcomed Dr. Panchanathan. The Director expressed his gratitude for the service everyone has provided to better NSF, the scientific community and the nation. He said NSF has been ahead of the curve in engaging with the new administration around the four pillars of COVID-19 recovery, economic recovery, climate change and racial equity. He said all of his pillars at NSF perfectly align with the administration's pillars. It is an exciting time for science with the attention it is receiving, not only in words but actions. Even before the inauguration, the new administration was looking at the kinds of things NSF was doing, and they were impressed and pleased that NSF is already totally aligned and more than capable to achieve the goals the administration desires for the nation. There has been tremendous enthusiasm and lots of conversations between the administration, NSF and the Hill. The President's budget outline has proposed a 20 percent increase to the NSF budget. If Congress approves, it will be the largest increase NSF has ever received in dollar terms and in percentage terms, year over year. A significant component is around the climate change pillar, which aligns perfectly with the areas OPP is focused on.

The second exciting thing is the American jobs plan that the President introduced in Pittsburgh, where he talked about the R&D ecosystem that has to be more robust, more scaled up, more intensified to out compete other nations but more importantly deliver the promise, potential and progress for the nation. There is a \$50 billion investment for NSF that is a proposal to be considered by Congress. In addition, the House and the Senate are putting forth legislation.

He added that any opportunity comes with responsibility, so NSF is working to plan for these kinds of outcomes, not knowing what they might be. He also discussed his testimony to Congress and said he is talking with community people to make sure everyone is singing from the same songbook. He also spoke of the responsibility to ensure NSF gets the appropriate resources so the scientific community can advance their fantastic ideas and groom talent for the future.

### *Discussion*

Dr. Weingartner expressed the AC's gratitude for the hard work NSF, its contractors and the scientific community have done throughout the pandemic to cope the best way they can and achieve results and keep programs and people going throughout this difficult time. He added that Polar Programs has long been an interdisciplinary program involved in any number of international efforts. This has worked well for research on climate change because it is an international problem and an interdisciplinary problem. He also mentioned that more than a year ago the AC started to address diversity, equity and inclusion (DEI) issues within the polar sciences and how to overcome impediments. He said the AC is happy to see this has been a priority for the Director and the administration.

Dr. Viereggs provided an update on the groundbreaking astrophysics and cosmology that has happened in the polar regions. There are major ongoing efforts at the South Pole and through collaboration between NSF and NASA. These have been critical for the advancement of astrophysics and astronomy. The South Pole in particular is critical and has been at the forefront of two major research areas, neutrino astronomy and the study of the early universe using the cosmic microwave background. The results from NSF supported telescopes across these fields have been field leading; this is the best place in the world to do this research. The past 10 years has seen the discovery of high energy neutrinos from IceCube that started neutrino astronomy and multi-messenger astrophysics, precision measurements of the early universe using the cosmic microwave background from telescopes at the South Pole like BICEP and the South Pole Telescope. The science case is compelling and is growing. Two very large efforts that are bringing the scientific community together, one in neutrino astronomy, an effort moving towards IceCube-Gen2, and one in the cosmic microwave background observations that is moving towards Cosmic Microwave Background (CMB) Stage 4. IceCube-Gen 2 would work together with the Laser Interferometer Gravitational-Wave Observatory (LIGO) and other observatories NSF funds to combine information from multiple messengers to get the best picture of the universe by measuring light that's 14 billion years.

Dr. Panchanathan said he felt like he was listening to his father, a radio astronomer.

Dr. Hayden said there's a diverse contribution that would be realized by having better inclusion and diversity within the polar research community. So, the Sub-Committee has been tasked to look at the programs that OPP and NSF offer and craft recommendations to help OPP move forward and promote better diversity and inclusion throughout the polar research community. The committee has gone through a number of learning activities to prepare for this process. One of the recurring ideas within each learning activity is that the outcomes sought are being realized

when a program is very intentionally focused on inclusion of minorities and outreach, identifying the talent, and then cultivating that talent.

Dr. Panchanathan said he was keen to see how NSF might change and talked about the demographic of talent that needs to be excited by the kinds of things that are made possible by OPP. He said his dream was to excite kids at the K-12 level to say they want to be researchers at the South Pole. He added that COVID has shown that remote science and remote explorations are possible. Not for all things, but it's opening up a new era of how science can be made extremely exciting, even though you're at a distance.

Dr. Hoffmann said there will be recommendations to identify and touch upon the learning environment Dr. Panchanathan described. OPP is uniquely positioned to bring huge data sets into classrooms to improve the accessibility of remote places. Also, going forward and thinking about these mechanisms of how to recruit and sustain diversity in early career scientists. The pandemic is hitting all students, but hitting those from diverse and underrepresented groups especially hard. This has to be an effort that is distributed across the Foundation, but OPP really wants to play a role and make a recommendation to figure out how to support these students during what's going to be a really difficult moment for them in either undergrad or graduate school.

Dr. Panchanathan said NSF is very grateful to the administration and Congress for the American Rescue Plan. NSF received a \$600 million infusion for helping with facilities and researchers and particularly COVID-impacted researchers. Also, a significant portion of NSF's FY '21 budget is focused on disproportionately affected individuals and institutions. NSF is intensely focused on that because the community is suffering a lot. And NSF needs to make sure it is there to help, particularly early career researchers and our graduate students.

Dr. Nettles spoke about the intersection of COVID impacts with the lack of diversity in that transition from undergraduates into graduate school. There is concern about the possibility that many undergraduate students most impacted by COVID are from underrepresented minorities or have family responsibilities. There is a danger that two to three years of those students will not become entrained into the science workforce. She said there is a need for NSF to focus some of its financial resources on students coming from undergraduate programs into graduate programs and finding ways to enhance support that's flexible, particularly in the face of universities being conservative financially right now and reducing acceptances of students, just as students without as many financial resources are the hardest hit. There is a need to support those most vulnerable parts of the young research population on a multi-year basis, which will also have a ripple effect of supporting early career faculty as well.

Dr. Panchanathan said undergraduates are also in his thinking, particularly minorities and the underrepresented; they are the ones NSF needs to nurture so they might pursue graduate degrees and other things they're seeking, and NSF will do more, no question about that. He said that in the context of artificial intelligence (AI), he has been talking about the importance of every State. In the last two weeks, he had a detailed discussion with tribal leaders about the challenges faced by tribal colleges and tribal universities. Last week he spoke to the leadership of historically black colleges and universities (HBCUs), trying to see how NSF needs to do more in terms of

engaging with HBCUs. How might NSF have an HBCU lead a major grant? NSF needs to build capacity and resources for building infrastructure.

Dr. Lynch said NSF-funded research in and around Greenland has made long-standing and highly significant contributions to climate change, giving a new perspective on the capacity for abrupt change in the whole Earth system. Greenland research continues to be groundbreaking, with broader significance because of the geopolitical ramifications of Greenlandic self-determination. She asked what their role will be in NATO and noted that a new U.S. consul has been appointed. Also, there are questions about mining rare earths. In this context, there are NSF research projects that have strong productive collaboration with Greenlandic people and cross fertilization of educational opportunities going both ways. There is appreciation for NSF's flexibility, because we've had to press pause for a time, but everyone has had to work hard to maintain relationships with these communities.

Dr. Panchanathan said he agreed about the geopolitical importance of Greenland and what it means to be able to get the Arctic programs done at the highest level of intensity. NSF has the attention of the administration, he said, and regarding the climate change context NSF will have a lot of exciting things to do in the very near future in that context with Greenland. NSF is also part of the Climate Innovation Task Force.

Mr. Stone said it is an Office of Management and Budget (OMB) and Office of Science and Technology Policy (OSTP) activity to bring together all the agencies focusing on climate innovation. There are many opportunities there to focus on the things that are going to drive it forward. It's getting a tremendous amount of visibility. The Department of Energy (DOE) is also preparing a large push into climate, so it's a major priority.

Dr. Viereggs spoke about research emerging from the Long-Term Ecological Research (LTER) project. For the last two decades, the Arctic and boreal LTER programs have focused on understanding the growing footprint of fire on northern landscapes. With a warming climate and more lightning, there's more fire weather and bigger, more severe fires that threaten people and resources, while also releasing old stored carbon to the atmosphere. This is a positive feedback cycle that could accelerate the interactions between terrestrial ecosystems and the global climate system. There has been a flurry of new publications in the last month, including one that showed lightning ignitions are moving north and increasing and fires are turning up in places like Arctic tundra, wet and cold places that haven't seen regular fires for thousands of years. In another paper, a group showed that zombie fires, or fires that overwinter and then pop up the next spring, are hastening the start of the fire season in Alaska and parts of the Northwest Territories in Canada. She said her group published a paper two weeks ago that synthesized 15 years of work at the Bonanza Creek (BNZ) LTER and found that when they took into account long-term forest recovery and ecological change, mainly a shift in tree species dominance, these forests could compensate or overcompensate for that immediate fire driven loss of carbon. This is one example of a negative or mitigating terrestrial feedback to climate via the carbon cycle. It's something that could put the brakes on the climate fire cycle.

Dr. Panchanathan said these are fantastic programs and said he was glad this is bringing out some interesting dimensions of what we need to focus on, and he appreciates the work she and

the scientific community are doing. In closing, he expressed his appreciation to everyone and said to contact him if he can be of help.

### Update on NSF GEO Activities

Dr. Easterling; Dr. Isern

Dr. Easterling informed the committee that his four-year appointment as Assistant Director (AD) is ending May 31. His Deputy Assistant Director, Dr. Isern, will serve as Acting AD of GEO while a search for the new AD is completed and the person is in place. Dr. Isern said she was honored and had large shoes to fill. She promised a smooth transition to the incoming AD when that appointment is made and committed to continuing the strong working relationship with OPP.

Dr. Easterling said the President's high-level budget priorities for FY '22 include almost \$10.2 billion for NSF, representing a 20 percent increase. NSF, he said, could increase investments to enhance fundamental research and development to address a real need and come to a better place in racial equity in science and engineering. A major Biden priority is climate science and sustainability research, strengthening U.S. leadership and emerging technologies and constructing additional major research facilities to stay at pace with what the research community needs.

Dr. Easterling shared a White House fact sheet on investing in R&D and the technologies of the future:

- Advance U.S. leadership in critical technologies and upgrade America's research infrastructure.
- U.S. leadership in new technologies—from AI to biotechnology to computing—is critical to both our future economic competitiveness and our national security.
- Based on bipartisan proposals, President Biden is calling on Congress to invest \$50 billion in NSF, creating a technology directorate that will collaborate with and build on existing programs across the government.

Dr. Easterling said the new directorate would facilitate translational research, innovation and the formation and maintenance of partnerships, including with private industry, universities, and other agencies. The enabling language stresses technologies that include AI and quantum computing. He added that he convinced the Director and other NSF leadership to include several elements of GEO and OPP, including advanced sensor technology and simulation modeling. President Biden's major priorities include fighting COVID-19, economic recovery, racial equity and climate change. The latter has not been openly discussed as a scientific topic very much at NSF for the past four years. NSF's and GEO's vision line up well with these priorities, so GEO will continue to have strong roles to play in all these areas.

Dr. Easterling also discussed efforts to change NSF and GEO culture, prompted by recent events, adding that discrimination, racism, or injustice have no place in NSF or in the research communities it supports. NSF has taken a lead among Federal agencies responding to this challenge. He outlined the new NSF Racial Equity Task Force, established to promote diversity, broaden participation, and break down barriers to inclusion. It is currently reviewing internal and external policies and practices. He said GEO is leading its own effort to change for the better,

internally and externally, noting that the geosciences have lagged far behind other academic disciplines in achieving greater diversity and inclusion. GEO also has its own team looking internally and externally to share educational resources to enhance its relationships with minority serving institutions and professional societies.

He also said funding kept moving to PIs throughout the pandemic, which was one of the great achievements NSF has had. It kept the merit review system up and running almost without interruption during the move to remote working and saw impressive successes and he highlighted some investments of note:

- Resilience and broadening participation
- AI
- Mid-scale infrastructure
- Convergence research

Expanding on the first point, he highlighted Coastlines and People (CoPe):

- Understanding impacts of coastal environmental variability and hazards on populated coastal regions.
- Research Hubs structured using a convergent science approach.
- 2020 solicitation received 98 proposals, total requested dollars: \$977.8 M
  - 55 proposals for small-scale topically focused hubs (\$1M/yr., 5 years)
  - 43 proposals for large-scale interdisciplinary hubs (\$2-4M/yr., 5 years)
  - Awards made by end of FY 2021 (September)
- Another program solicitation planned for FY 2022

He also presented an update on major GEO facilities:

- Ocean Observatories Initiative (OOI)
  - Community is engaged through an Innovation Lab in proposing a new location for the Pioneer Array
  - Cyberinfrastructure is transitioning to Oregon State University from Rutgers
  - South Cable of the Regional Cable Array remains offline pending repair of a fault that occurred in Aug 2020; repair anticipated this summer.
- Regional Class Research Vessels (RCRV)
  - Construction experienced delays within a timeframe expected for such complicated vessels, and additional unexpected COVID-19 impacts.
  - The delivery schedule has been replanned to account for these changes.
  - Ships are expected to enter service in 2023 and 2024.
- National Center for Atmospheric Research's (NCAR) Research Aviation Facility
  - Construction is on schedule and on budget, with anticipated completion in late April 2021.

Next, he discussed the U.S. National Academy of Sciences, Engineering and Medicine (NASEM) Earth System Science Study:

- Study on track with results expected in 2021.

- Informative workshops on education and workforce, engineering, social sciences, and computing and cyberinfrastructure.
- [Website/Mailing List](#)

He added that the Academy is helping NSF develop a vision for a systems approach to studying the Earth that takes into account all components of the Earth system, the requisite facilities, infrastructure, computing resources, coordinating mechanisms and workforce development efforts to make the vision a reality. He said the recommendations will have major impacts on GEO and OPP research strategies.

Dr. Easterling also highlighted some recent research. He discussed an IceCube research project that demonstrated its ability to do fundamental physics. He also noted the discovery of an ancient lakebed more than a mile beneath ice of Northwest Greenland, the first ever discovery of such a subglacial feature.

Turning to the challenges posed by the COVID-19 pandemic, he thanked everyone for the time they've given to participate in the AC. He also highlighted students in the Scripps Undergraduate Research Fellowship (SURF), designed to engage students in Earth, ocean and atmospheric sciences research. The program offered a new model of operation with a virtual program that allowed additional students to participate in a fully remote summer research experience. He also outlined how GEO has been responsive to COVID-19 realities:

- New/Renewed Solicitations
  - OPP Postdoctoral Research Fellowships (OPP-PRF, NSF 21-575)
  - Ocean Sciences Postdoctoral Research Fellowships (OCE-PRF, NSF 21-538)
- Dear Colleague Letters
  - Supporting Use of Existing Data and Samples in Atmospheric Sciences Research and Education (NSF 21-064)
- Opportunities for Mid-Career Scientist Support in the Atmospheric and Geospace Sciences (NSF 21-018)

NSF wanted to make sure people at universities and research institutes knew the Foundation was open for business and sent out and posted letters providing COVID-19 information linking to the latest guidance from NSF and OMB and describing impacts to the Polar research seasons and the academic research fleet. There were NSF workshops to assist first time proposers and early career scientists with understanding the NSF system. And the Distinguished Lecture Series was revived. The Frontiers of Ocean Sciences Symposium was moved online last year and the second will be this June. NSF hosted webinars and office hours. There were listening sessions to hear from GEO rotators and benefit from their experiences of this new mode of working and to learn what was happening at their home institutions. NSF heard about the extraordinary impact to the geosciences community from field campaign disruptions, lab closures, staffing reductions and increased workload.

NSF and GEO have tried to be as responsive as possible to the COVID-19 realities. OPP and the Ocean Sciences Division released postdoc fellowship opportunities to support early career scientists in AGS, issued two DCLs to support the submission of proposals that leverage existing data and physical samples and to encourage proposals from mid-career scientists.

Dr. Easterling also updated the AC on the number of proposals received and supplements requested, with a preliminary analysis showing little change in GEO’s proposal pressure during the pandemic.

	Fiscal Year 2017	Fiscal Year 2018	Fiscal Year 2019	Fiscal Year 2020
Proposals Received	5,309	5,096	5,131	4,968
Supplements Requested	295	356	371	385

He said the numbers for the current year are not complete. A significant change in proposal pressure had been anticipated, but the numbers demonstrate the resilience of PIs in the face of unprecedented stresses. A grant has been awarded to the American Geosciences Institute (AGI) for a COVID impact study that includes academia and industry.

Dr. Easterling also reviewed GEO senior staff changes for 2021:

- Anjuli Banzai named to Senior Advisor of Global Climate Change in Office of the Assistant Director (OAD)/GEO
- Candace Major named Division Director for AGS
- Robert Moore named Acting Section Head for Geospace Sciences AGS
- Michael Jackson named Acting Section Head, Antarctic Section in OPP
- Jennifer Mercer named Acting Section Head, Arctic Section in OPP

*Discussion*

Dr. Weingartner asked about the location of the South cable in the regional cable array; the answer was not available.

Dr. Heimbach suggested adding to the data capability or compute capability so people can do the analysis closer to the data, which would further democratize the ability to analyze the data. Dr. Easterling said it was an outstanding suggestion that squares with recent developments at NSF, because of the possibility of increased funding in the area of climate change. GEO has been signaled to be the lead directorate in helping organize it, so NSF doesn’t go off in 100 different directions. He contacted a colleague at the Computer and Information Science and Engineering (CISE) Directorate and will work more closely together to find common interests, particularly around climate change and sustainability.

Dr. Stammerjohn said the recent AC/GEO meeting included a discussion of how GEO could be better poised to do integrated or system science or transdisciplinary science and asked Dr. Easterling for his takeaway and how GEO is going forward with these kinds of ideas. Dr.



Easterling said the AC/GEO discussion added coefficients to the basic equation that will be received from the Academy recommendations. It is reassuring that NSF's early thinking about the first step toward more of a systems like approach is in the science of Earth system predictability. There's never been a greater need for there to be basic research that looks at all the interconnections between the different parts of the Earth system. NSF has been trying to shine a light on something it is built to do—the basic science of prediction. The AC/GEO conversation was an affirmation that the agency is on the right path. Another aspect is resiliency. One can argue improved resiliency in physical, biological and ultimately human systems accommodates greater predictability, but with climate change the Earth is committed to a certain amount of warming, no matter what one tries to slow or halt emissions. It makes evident sense to understand at a systems level what successful adaptation and response resilience in the face of these forcings look like.

Dr. Kuklina asked about the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) and opportunities that might result for transdisciplinary research. Dr. Loose said the field work ended in October 2020. Since then, the MOSAiC International Project Board has been continuing biweekly meetings in preparation for the research coming down the pipeline. This has coincided with the discussions last year on justice, equity, diversity and inclusion. The board has adopted inclusive and fair-minded guidance for the scientists on how to handle authorship and attribution. There's science that's internationally generated from the 19 different participating countries and because of the cooperative nature of the research, establishing an equitable way to handle those questions has been a struggle. He added that the data infrastructure part largely should be credited to NSF and the Arctic Data Center. There will be a pipeline for pushing out these publications and data results that honors the originating PIs but also gives them a chance to work with their data and makes the data available. Requests continue to be received for endorsement, which is the official title given to a project that can use MOSAiC data. This data set is going to live much beyond the actual fieldwork and will allow people to interrogate the Arctic for years to come. Also, there have been some publications that aren't out yet that have come to the board, including the detection of Atlantic cod and squid species that appear to be feeding off food sources associated with Atlantic water and interesting changes to snowfall distributions. Dr. Easterling said most of the outside world believes that when observations stop it's over. In fact, the front end of observation may very well just be a tiny fraction of the benefit from MOSAiC.

Next, Dr. Falkner asked three new staff members to introduce themselves: Kimberly Ohnemus, Tammy Perkins and Sara Eckert.

#### Wrap-up and Adjourn for the Day

Dr. Weingartner; Dr. Falkner

Dr. Weingartner thanked everyone for their contributions and thoughts. He said he was overwhelmed everybody's been able to do their job as best as they can during this difficult period.

Dr. Nettles asked if there are additional resources or changes in practice to help support the load staff have been carrying during the pandemic. She said there will probably be at least another

year of this situation. She said she was impressed with the way NSF at every level has managed the situation and said the support people are trying to provide for those they work with. She asked if there are concrete things the committee could do to help with that load in the next year.

Dr. Falkner agreed it has been a prolonged sprint. People were built for an adrenaline rush to respond to an emergency, but not to sustain that rush indefinitely. It is very likely, as Dr. Nettles said, that it isn't going away anytime soon. Even if it were, there'd be pent up expectations, concerns, worries and so forth. This year's results of the Federal Employee Viewpoint Survey, taken in November, show the workload within OPP is of high concern. OPP is working to hire additional people and fulfill vacancies. And other things are in the works that cannot yet be announced. She anticipated bring on more IPA assignees to ease the workload. It's been recorded that Dr. Nettles has raised this concern and will be carried forward in further deliberations. Dr. Nettles said it's good to hear that there is hiring. If the committee can help, she thought everyone would be willing to advocate for that.

Dr. Falkner noted the action items that came up during the meeting so far. The AC has talked about Russia being a concern. OPP will try to arrange for Rebecca Keiser, Chief of Research Security Strategy and Policy, to talk to the committee. And Dr. Stammerjohn would like to see additional communication regarding Antarctic research vessel activity. Dr. Weingartner suggested reviewing the COV reports in anticipation of tomorrow's NSF response. Also, he asked about the timeframe for the Subcommittee on Diversity and Inclusion. Dr. Falkner said there wasn't a particular deadline. Dr. Hayden said the committee report was targeted for 2022.

Dr. Falkner adjourned the meeting for the day.

## **Friday, April 30**

### Advisory Committee Liaison Updates

Dr. Heimbach; Dr. Lynch; Dr. Emanuel

Dr. Falkner apologized to AC members who prepared material for Dr. Panchanathan yesterday but were unable to intervene due to time constraints and then introduced the day's first agenda item.

Dr. Heimbach described the role of the AC on Cyberinfrastructure (ACCI):

- ACCI advises the NSF Office of Advanced Cyberinfrastructure (OAC) within CISE. OAC supports cyberinfrastructure (CI) resources, tools and related services such as:
  - supercomputers, high-capacity mass-storage systems
  - system software suites and programming environments
  - scalable interactive visualization tools, software libraries and tools
  - large-scale data repositories and digitized data management systems
  - networks of various reach and granularity
  - an array of software tools and services that hide the complexities and heterogeneity of contemporary cyberinfrastructure while providing ubiquitous access and usability
  - education & training at various levels.

Dr. Heimbach presented a graphic showing how OAC envisions going from data observations and codes to scientific discovery and referred members to NSF's vision for a [National Cyberinfrastructure Ecosystem for Science and Engineering in the 21<sup>st</sup> Century](#). He also discussed data-intensive discovery pathways, or the "missing middle," which he described as improving discovery from data sources to scientific outcomes.

He described a high-performance computing architecture that requires new algorithms, new codes, new software and new interfaces, which could potentially be revolutionary, and how to take advantage of these seismic shifts in computing in climate modeling and astrophysics.

He also presented OAC's big questions for ACCI:

- Research Agenda:
  - What constitutes CI research and what is the OAC research agenda?
  - How does OAC foster/nurture its research community to ensure innovations?
- Reproducibility:
  - What is the unique role of CI and OAC in the broader conversation on reproducibility and repeatability of research results?
- Integrated CI Ecosystem:
  - How does OAC evolve its priorities and programs to address the growing need for an integrated CI ecosystem?
- Sustainability:
  - What is OAC's role in sustainability of resources and services, including compute, data/storage, networking, software, educational?
  - Difference between making resources/services sustainable and sustaining resources/services? Should OAC focus on the former and work with the community on the latter?
- Strategic Investments:
  - What is OAC's role in a rapidly changing application and technology/service landscape?
  - How does OAC prepare for technology disruptions (e.g., beyond Moore's law, quantum, etc.)?
  - How can OAC partner with industry?

He said there are three subcommittees. The first is on reproducibility and sustainability. This subcommittee asked what role NSF has in implementing some of the recommendations of a National Academies report released on 2019 on this topic. He said there are different ingredients, such as data, computational environments and computational steps that lead to publishing the results. The question is how can making this reproducible and sustainable also make the science more robust. The vision for trustworthy computational science has been looking forward to a future for computational science where all computational results are reproducible, including those from pipelines across multiple teams. Effective and efficient reproducibility will enable qualitative advances in science and make possible a new level of demonstrable trust in scientific results and outcomes.

The subcommittee produced a summary of opportunities:

- Research

- 2.1 Support research in reproducibility essentials
- 2.2 Support improved provenance capture and replay
- 2.3 Support advanced reproducibility testing
- 2.4 Support holistic approaches to advancing trustworthiness
- Infrastructure
  - 3.1 Enable standardized research delivery
  - 3.2 Promote community software stacks
  - 3.3 Establish a Research Software Engineer career track
  - 3.4 Establish a digital asset management plan
- Programmatic
  - 4.1 Establish reproducibility training and certification
  - 4.2 Elevate reproducibility priorities in project funding and review
  - 4.3 Support specific funding for reproducibility
  - 4.4 Start a working group on reproducibility policies, tools, practices
- NSF-wide
  - 5.1 Establish a reproducibility initiative

The second subcommittee is CI Research and Innovation. It is mainly focused on the application of machine learning and AI and has six themes:

- Theme 1:
  - Robust data harnessing and domain dependent CI prototypes
- Themes 2 and 3:
  - Trust and Explainability for AI; Machine Learning across the CI for Science & Engineering (S&E)
- Theme 4:
  - Deeply Network-aware scientific workflow management systems, software-defined cyberinfrastructure and intelligent networks
- Theme 5:
  - New models and paradigms for S&E discovery based on AI; Enabling Virtuous Cycles
- Theme 6:
  - Enabling simulation-based science to fully harness Computing of the Future; novel computational algorithms, languages, programming paradigms

The third subcommittee is Learning and Workforce Development. Its task and deliverables are:

- Provide recommendations to OAC and NSF regarding CI workforce requirements (from both capability and capacity perspectives) to sustain and accelerate scientific discovery.
- Key Deliverables:
  - Report Findings: Synthesize, analyze, and summarize the recommendations of the NSF CI Workforce 2020 workshop report with other community workforce findings.
  - Results of Survey: Based on NSF CI Workforce 2020 report and synthesis of community reports, create survey for all NSF-funded PIs to gauge their awareness and needs.
  - Recommendations:

- Highlight references of workforce in the President’s Council of Advisors on Science and Technology (PCAST) 2020 report: Recommendations for Strengthening American Leadership in Industries of the Future.
- Provide recommendations on how CI professionals can be included in the skilled technical workers referenced in the executive summary of the report.

In conclusion, Dr. Heimbach said the ACCI discussed a joint meeting with another AC and suggested AC-OPP might be interested. The ACCI has set its meeting dates for September, so if AC-OPP is interested, it would have to move quickly.

### *Discussion*

Dr. Weingartner asked if ACCI is exploring ways to enhance accessibility from rural or underrepresented communities. Dr. Heimbach said they are considering this and a Webinar is scheduled for next week on this topic. The topic is being considered by the third subcommittee. Dr. Falkner said OPP has a vested stake in that Alaska and elsewhere are not well networked.

Dr. Bartlett asked about cybersecurity. For those with Department of Defense (DOD) support who deal with controlled and classified information, the rules for demonstrating cyber security measures are becoming very strict. This is percolating to other agencies and he asked where NSF is in that regard. Dr. Falkner said NSF has long been subject to the same government rules for cybersecurity and is subject to the Federal Information Security Management Act, which includes frequent audits. The separate network in Antarctica is part of the overall NSF network now, but is separate from the NSF internal network, so OPP gets audited independently on that. She suggested that at a future meeting OPP provide a more explicit overview of those functions at NSF and who does what.

Dr. Bartlett added that for those with DOD funding, PIs have to demonstrate compliance with cybersecurity and asked what those who receive NSF funding might have to demonstrate in the future. Dr. Falkner said it is a fast-moving situation, but she was not currently aware of such a requirement for PIs. However, government rules and regulations pertain on all awards that people have to remain compliant with. The best answer would be to bring in a specialist.

Dr. Pope said that for some big awards, such as the Polar Geospatial Center (PGC), which manages a large amount of polar and sensitive data, there are cybersecurity consultants and audits as part of its operations. NSF also has funded the Cybersecurity Center of Excellence (CCoE) to support other NSF-funded programs to make sure they are able to implement the best practices in cyber infrastructure to look after NSF-supported data.

Dr. Falkner said many practices layer on some burden in the process of increasing security. She offered again to provide time for a more fulsome picture of this and work with folks at NSF whose responsibility is to handle these things.

Dr. Marsh said a lot of work in cybersecurity relies on university institutions and their information technology (IT) programs. With more use of Web resources and cloud

computational services it enters a commercial sphere and there is more vulnerability to having to take responsibility for ensuring that accounts being used outside of a standard IT system are meeting cybersecurity guidelines that might be in place for a project.

Dr. Falkner mentioned a program where NSF sets up its own phishing campaign to see whether the agency is sufficiently well trained. She acknowledged getting nabbed once and subsequently is very leery. She would also like to think about what the OAC has been doing in coordination with Polar and will put that as a marker for the next meeting.

### Advisory Committee Liaison Updates (Continued)

Dr. Emanuel provided an update on the Committee on Equal Opportunities in Science and Engineering (CEOSE). CEOSE is a congressionally established committee that advises NSF on policies and activities related to broadening participation of people from underrepresented groups in Science, Technology, Engineering, and Mathematics (STEM). One of the main roles of CEOSE is to report to Congress in cooperation with NSF. The next report will come out this year and cover the period from 2019 to 2020. CEOSE also weighs in on the [NSB Vision 2030](#) strategic plan for STEM, which focuses on strategies for maintaining the U.S. position as a global leader in fundamental research, contributing to society more broadly and broadening the participation from the United States in STEM education and in the STEM workforce. CEOSE looked at a key finding in the strategic plan that the STEM workforce is not representative of the U.S. population. Women, African Americans and Hispanics or Latinos would need to double or triple their numbers for the workforce to be representative of the U.S. population. This is sometimes referred to as the missing millions idea. The theme of the coming report is making visible the invisible and a recommendation is that NSF support leadership towards broadening participation. The committee is recommending demonstrating and supporting and rewarding leadership in that area. Dr. Emanuel said he noticed the absence of indigenous peoples from the statistics. He and others from the committee wrote a note to the NSB to highlight this omission. He also stressed the role of indigenous knowledge systems and defining the STEM workforce. He also noted that the NSB plan focuses on community engagement and citizen science, which are recognized as important tools for broadening participation and advancing fundamental research and he encouraged AC members to share the Vision 2030 plan at their institutions.

### *Discussion*

Dr. Quinn asked about maintaining women in the workforce, especially after COVID-19. She said they drop out after receiving a Ph.D., starting a postdoc and having children, when it's harder to keep them in the system. Dr. Emanuel said one of the aims of asking NSF to focus on leadership and broadening participation is to move beyond thinking of a problem in the pipeline. It's a matter of getting people in positions of leadership.

Dr. Emanuel agreed to Dr. Crowell's request to provide CEOSE's letter to NSB.

Dr. Weingartner asked about challenges among universities highlighted in *Vision 2030*. Dr. Emanuel said he did not believe there were any links to further information in the document.

Dr. Viereggs referenced the notion that the problem is not a pipeline issue and asked if CEOSE discussed field dependent issues and looking at where the loss is happening. She said that in physics the problems are a little different. Dr. Emanuel said the committee did not talk about specific field approaches but would raise it with CEOSE.

Dr. Falkner added that there are fields in which women are so-called over-represented — biological and medical fields. But you get into engineering, computer science and physics and the pipeline is a problem. That has been under discussion by the board. She offered to provide its recent discussions centering around Broader Impacts and broadening participation.

Dr. Loose asked about the statement that the committee was looking at the pipeline and didn't see that as an issue because there are qualified people from these different groups available to step into leadership positions. Dr. Emanuel said he was emphasizing the top-level recommendation from the forthcoming CEOSE report, which emphasizes leadership instead of filling the pipeline. CEOSE recognizes that the pipeline remains an issue. But the recommendation he highlighted focused on the other end. He did not want to give the impression that it is not a significant issue or that it's not important to CEOSE. Dr. Falkner added that the recommendation asks NSF to be far more intentional about that end of the issue.

Dr. Quinn brought up field work and said it was especially important to pay attention to women who have to go into the field and it's hard to keep them in the pipeline. Dr. Falkner said there are many elements to field activity that have been problematic, including harassment. But the Academy looked at that issue and to what they call gender harassment as a factor that causes the pipeline to leak. The thinking had been it is child raising and these kinds of things blocking women from staying in the field, but they concluded there's the element of exclusivity and "death by many small cuts" of gender harassment. There can be harassment towards all definitions of gender. It remains an issue and field work has emerged as an important place where the non-inclusive culture sticks out. Her team is committed to making that change, but it's a work in progress. There is a lot more work to do.

Dr. Steig said that in the glaciology community, the assumption that you're not actually a scientist if you're not spending time in the field is also a problem. The message should be, you're welcome here, even if the kind of science you do doesn't happen to involve spending time in the field. Dr. Falkner said there is an unwritten sense that you must earn your mettle in prescribed ways but the unwritten needs to be challenged.

Dr. Pope added that one of the aims behind the DCL on polar data sample reuse was that aspect of inclusivity and making sure polar scientists saw themselves in all sorts of polar science and not just in field science. Dr. Falkner said it takes a village to do polar science. We don't want to under appreciate the hard work that does happen in the field. But it's equally important to do the other bits and pieces. We need teams. With COVID, people are being more mindful of how different groups contribute to our lives at a very basic level.

Dr. Nettles agreed that the inclusivity issue is important for women, but also for anybody who doesn't look like the traditional stereotypical face of polar research. Even active research groups who may be trying to be inclusive and welcoming may not realize they're not. Keeping a broad

view of the importance of inclusivity is critical for women but also other underrepresented groups in polar science. In terms of things NSF can do, she said the risk management workshops are partly designed to support a community of practice and ongoing dialogue and come up with good practices rather than best practices, as has been said. And something along those lines might be useful in polar science in the realm of thinking about how we frame fieldwork and other work in producing practices that are inclusive and supportive. We have a lot of well-intentioned people. But there is a lot of ignorance as well. Dr. Falkner said that may be something the subcommittee could take forward.

### NSF Response to Antarctic Sciences Committee of Visitors Report

Dr. Mack; Dr. Jackson

Dr. Jackson thanked the COV members for their efforts. The COV represented a broad section of the Antarctic research community and was diverse. He presented the following statistics for the COV's work:

- Date of COV: April 28-30, 2020
- Period of Review: FY16-FY19
- Number of actions reviewed: 283 (151 projects, due to collaborative proposals)
- Awards: 72 (41 projects) (competitive proposals, subject to external review)
- Declinations: 167 (71 projects) (competitive proposals)
- Other: 44 (39 projects) (Returned Without Review and non-competitive proposals)

Dr. Jackson divided the COV recommendations into six themes, beginning with those grouped under the heading of proposal processing:

- Recommendation. All programs should strive to incorporate panel review into the merit review process in addition to maintaining ad hoc reviews.

Dr. Jackson said ANT is committed to using both panels and ad hoc reviews when assessing proposals submitted for reception, with a decline of proposal numbers after the removal of Antarctic deadlines it's become an increasing challenge. However, where there's insufficient proposal numbers, ANT has decided to look outward to either the Arctic section, other places in GEO or NSF wide to hold joint panels with other programs and do panel reviews for all proposals.

- Recommendation. ANT is encouraged to hold more virtual panels allowing increased opportunities for broader participation.

Dr. Jackson said ANT supports the way NSF program officers, staff and the community have embraced the virtual workforce model necessary due to the pandemic. Virtual panels provide benefits for broadening participation. For the foreseeable future, ANT will continue virtual panels as part of the merit review process. When safe, it will move to a more pre-pandemic model with some people in person and some participating virtually.

- Recommendation. ANT POs should encourage their panels to provide more thorough rationales for proposals that are unlikely to be recommended for funding.



Dr. Jackson said this is something ANT wants to keep track of. He always looks at panel summaries to see a clear alignment between the panel recommendations and the Program Director's recommendation. He said ANT agrees with the recommendation and will continue to track it. All of ANT's Program Directors believe it's important that panel summaries provide constructive feedback to early career investigators and to PIs new to the Antarctic program, both for awards and declines. In response to a question about whether there's language in the documents regarding rationales for proposals unlikely to be recommended, and if giving a negative review means there's a higher bar for how they have to justify that, Dr. Jackson said that is done mainly with PO comments and the ad hoc and panel reviews that are sent to the PIs. In addition, the ANT programs best practices include clear justification from the POs for both awards and declines.

- Recommendation. ANT should conduct a study of the causes of long dwell times and strive to reduce them.

Dr. Jackson agreed and said all Program Directors agree that dwell time, or the amount of time between receiving a proposal and any final action that occurs on that proposal, is something everyone is paying attention to. A study has been initiated to address this recommendation directly. NSF strives to achieve about 70 percent of its funding decisions within six months. ANT receives high-level reminders when programs are not meeting those expectations. He encourages Program Directors to move proposals through the review process quickly. For awards involving field work with logistics, the review process can be lengthy, especially for more complex proposals, which contributes to the dwell time.

Turning to programmatic recommendations, he began with:

- Recommendation. The programs should explore ways to support workshops that facilitate between different disciplinary groups within ANT to work together.

Dr. Jackson said ANT is already moving this recommendation forward and is committed to encouraging interdisciplinary research. As a result of recent changes, proposals come to the section head, who advertises those broadly to the ANT PO group. Then the group gets together and discusses who should take the lead. ANT has also long supported interdisciplinary workshops and will continue to do so.

- Recommendation. Provide more lead time for PIs and announce solicitations via listservs in addition to providing wider community access to the solicitation framing process as it occurs.

ANT recognizes, Dr. Jackson said, that researchers have to have significant lead times. These allow the community to respond to opportunities, especially for complex and Arctic field type projects. He said ANT could better advertise activities at its national meetings and through office hours. He said the Thwaites solicitation was released in October of 2016 and was advertised widely through the solicitation process and listed on ANT listservs. It was also put up on numerous social media outlets. There are more specialized OPP staff now focused on getting the word out through media outlets and there will be a better ability to do that in the future. Also, the Thwaites solicitation due date was on March 1, which gave almost five months for investigators

to respond to that complex solicitation. That was almost a month and a half more than the normal three-month response time from posting a solicitation to response deadline.

- Recommendation. The new bio investment from ANT could benefit from clarity to PIs that the program is willing to support either of the two aims and does not require that both be addressed.

Dr. Jackson agreed and said greater clarity would be helpful and would increase the community response to this opportunity. ANT will continue to explore the option of supporting a research coordination network to build community and advanced research in this area.

- Recommendation. That POs consider whether disparity in award amounts (not rates) across sections may discourage multi-disciplinarity or system-oriented thinking in proposal preparation.

Dr. Jackson said the COV noted a recent decline in numbers of awards to the Astrophysics and Geospatial Sciences program and an increase in awards in the Antarctic Sciences program from 2016 to 2019. Despite these trends, astrophysics and geospatial sciences maintained funding at a rate above average, while Antarctic Sciences was funded at the average rate for the review period. The committee also noted that polar education, astrophysics, geospace and the Antarctic instrumentation research facilities all have lower submission rates than average. From the program perspective, this is well known. Polar education is a smaller program and has a smaller budget. The astrophysics and geospace sciences have a large budget, but fund fewer projects because most projects tend to be large. And the instrumentation research facilities program is a technology force multiplier for the other POs to be able to draw from if they have instrumentation needs for their program. ANT will continue to collect data and look for any systematic disparities.

- Recommendation. Question if there are programmatic preconceptions about the typical size of an award.

Within the program there are no preconceived ideas on award size. If it has good science and a well-justified budget, the program has ways of getting things funded. The collaborative nature that ANT has taken on, and removing some disciplinary boundaries, is helping move this recommendation forward. Program Directors have a few levers to financially balance and fund larger awards. The main one is as a continuing grant mechanism, which can spread the cost of an award over multiple years. There is also the option of collaborating with other programs to help fund the effort, which is on the increase.

- Recommendation. We encourage the program to continue to increase the interaction with programs outside GEO, such as CISE, Engineering. Filling positions such as the PO in Polar CI could facilitate this.

ANT has made great progress on this. Last year ANT hired Dr. Pope, who is working both with the Antarctic section and with the Arctic section. He is working closely with CISE, including support for encouraging polar contributions to cyber infrastructure for sustained scientific

innovation, Cyberinfrastructure for Sustained Scientific Innovation (CSSI), EarthCube, cyber training activities and other open solicitations.

The next recommendations are under Broader Impacts (BI):

- Recommendation. NSF should clearly indicate that PIs should budget for BI activities that are not covered in standard budget categories such as student support.

Dr. Jackson said ANT agrees there are preconceived ideas in the community, especially among early career people, that BIs are difficult to budget or they shouldn't be budgeted for. The best mechanism for getting information like this out to the community is Program Directors spending time giving talks, providing listening section sessions, fireside chats and general mentoring sessions at national meetings and early career forums and in one-on-one conversations with people interested in talking about how to put in a proposal. At these venues, ANT stresses BIs must come with sufficient budget to accomplish the proposed scope. In fact, not including the costs for BIs can make a proposal less competitive. ANT is trying to address this from a grassroots level with information flowing out from the section out to the community in hopes we can make sure incorrect information is dispelled.

- Recommendation. NSF should clearly indicate that PIs should assess the impact of BI activities in annual and final reports and in the Results from Prior section of subsequent proposals. Reviewers, panel and POs should assess the success of past BI activities reflected in the Results from Prior section.

Dr. Jackson said ANT agrees and is looking for a comprehensive pan-Antarctic way of ensuring BI are reported as part of the annual and final reporting process. There are limitations because the annual and final reporting templates are set and it's difficult to get additional changes. But ANT is working on mechanisms to keep this at the forefront of people's attention through PO comments as part of awards and comments provided when annual reports come in and no activity is seen on BI. ANT is also looking for ways to make sure that when somebody proposes a funded BI that NSF can track that the impact is worked on as part of the project and there is some conclusion or there's a way of tying together what was proposed with what was accomplished. As part of the briefing process, the panel is told prior results should be taken into account. All Program Directors make their recommendations on the entirety of the package, which includes information contained in the prior results, as well as reviews and the BI.

- Recommendation. NSF should consider adding BI experts to panels.

This is an active topic within the Foundation and the NSB is actively engaging in re-examining BI Foundation wide. One recent activity includes a pilot project that recommends adding BI professionals on every COV. When populating panels, Program Directors choose panelists who have extensive experience with BI. They also try to balance a number of other concerns like demographics and diversity and make sure there are sufficient panel members to cover all the intellectual merit activities. For larger proposals, ANT could probably do better by looking at thresholds that might trigger when to put a pure BI professional on a panel and defining the level of expertise.

The next set of recommendations come under education and outreach:

- Recommendation. The committee noted that there was a lack of discussion in the ANT Self-Study about education opportunities and the community remains unaware of where research in this area is going. This could be emphasized.

He responded that OPP co-reviews and co-funds education research proposals submitted to programs such as improving STEM education, advancing formal STEM learning and the discovery K-2 research programs in EHR. ANT will submit those proposals to those programs if they're relevant to the polar sciences. Co-funding the proposals is important when it involves logistics in the polar regions. These logistics can complicate moving forward with the proposal. Generally, these projects involve undergraduates, K-12 teachers and students or the public. And research results are generally reported in peer reviewed education journals. ANT will make a stronger effort to ensure the results of education research supported within OPP are better and more frequently communicated to the community via periodic office hours, social media and are discussed at meetings and included as part of any future self-studies for COVs.

- Recommendation. The committee suggested two pathways for increasing awards to Public Minority Serving Institutions (MSI), HBCU, and other institutions: (1) NSF highlight funded researchers from institutions doing Antarctic research, and (2) supplements to core grants that fund opportunities for faculty and students from these institutions to partner with ongoing research grants.

Dr. Jackson said both are good suggestions that will be pursued. Currently OPP's main public communications method is via office hours, webpages, Listservs, DCLs, solicitations and Facebook postings or other social media and other options are being examined. ANT will consider support for awards that create opportunities for Antarctic researchers to meet with faculty from MSI, collaborate with those faculty and ensure they are interested in Antarctic research and have a place where they can pursue those interests. One currently funded effort is called the School of Ice, which has been successful and has broad participation across a spectrum of MSI as well as contributions from other Antarctic researchers. Additionally, the PolarTREC program could support faculty in MSI participation in many Antarctic research projects. ANT recognizes that more focused effort is needed to increase diversity in the polar sciences and the geosciences. As part of as part the AC's work, the Subcommittee on Diversity and Inclusion was created and all our Program Directors and staff are actively engaged in participating.

General recommendations include:

- Recommendation. New PIs should be encouraged to build professional relationships with POs.

ANT agrees; the personal connection between an NSF PO and especially new and early career investigators is very important. That component of mentoring is important in trying to keep everybody in the pipeline, including new investigators to the Antarctic and early career investigators. It would be heartbreaking if somebody that had never worked in the Antarctic program before felt there were barriers they could not penetrate to understand how to submit something to the program. ANT is actively trying to break those things down to make sure everybody has an equal opportunity to work in the Antarctic. Dr. Jackson said that as acting section he has led office hours sessions with an attendance of about 200 people per session that

emphasizes that PIs should communicate with their Program Directors early and often. The telephone is not used enough in trying to teach early career investigators how to boost their career. All Antarctic Program Directors are encouraged to build strong professional networks across their community base, as well as to reach out in a diverse fashion to other disciplines. Program Directors participate in a wide selection of professional mentoring activities. For the most part, ANT is trying to encourage these to be targeted at early career investigators. Activities include participating in mentoring activities and working with new PIs, early career folks, graduate students and postdocs on how to write proposals and how to be an effective advocate for one's own science. Professional meetings and face-to-face communications with PIs are indispensable for helping make these connections.

- Recommendation. We recommend improving internet connectivity in the main science labs at both bases.

Dr. Jackson said everyone actively feels the pain on this one and solutions to increase bandwidth at McMurdo and South Pole Station and Palmer station are being worked on. The Antarctic Sciences section is sponsoring a National Academies energy technology workshop that will focus on new and improved technologies. These will include communication technologies to advance, expand and transform the work being done around the polar regions. ANT is also considering a community workshop to look at the science and BI that could be accomplished with high-capacity subsea fiber optic telecommunications cable to the continent.

- Recommendation. ANT should continue to maintain a balance between rotators and permanent Federal employees.

Dr. Jackson said ANT agrees with this recommendation and will continue to seek out the highest qualified and diverse individuals to fill rotator and permanent positions. There may be new opportunities to get more rotator positions to pair with current staff. The Antarctic and Arctic sections are working closely and sharing rotator positions — for example, Dr. Pope in cyber infrastructure — and hope to soon bring on another shared rotated position in the glaciology program.

- Recommendation. NSF should sponsor some combination of workshop and webinar materials to address best practices around sexual harassment and overall safety in field operations.

Dr. Jackson said ANT is in full agreement. This month, OPP entered into an agreement with the Department of Interior's Federal Consulting Group and a contracting team of experts to assist NSF and OPP in creating a USAP-wide sexual assault harassment prevention and response program, known as the Sexual Assault/Harassment Prevention and Response (SAHPR) Program. The goal is to create a sustainable program OPP wide to support the entire cadre of deployed USAP participants regardless of program participation or affiliation. It has to take care of all of our station bases for all deployment types. As part of this program, ANT will advocate for a comprehensive input from its communities and ensure there is comprehensive distribution of information to participants.

## *Discussion*

Dr. Mack said her experience on the COV was very positive. There were high quality collaborative interactions with Dr. Isern, the staff and the POs. The self-study showed the committee quantitative data about the program, then it was able to mine the data that staff had put together to do its own analyses. Dr. Isern thanked the COV for its work.

Dr. DeGrandpre asked about making FastLane look more like a journal interface. Dr. Jackson said everybody would love to see some fundamental changes made and his office will be talking with the Office of Integrative Activities to make sure they hear this inclusively. Hearing this from both the Arctic and Antarctic COVs was helpful.

Dr. Crowell asked about including diversity and equity goals in the BI as guidance to researchers. He said there is a strong emphasis now on STEM education, public communication and community engagement. It might be good to suggest diversity and equity goals as part of BI. Dr. Jackson agreed, adding that within the Foundation, the BI designation can be everything from targeted diversity and inclusion-based BI to just having a graduate student work on a program. If diversity, inclusion and equity are important as BI, the question is how to get the word out to the community and make sure they're hearing that and including those types of activities. NSF just released a DCL looking at providing this guidance to the community and will take community input on how to best make sure it is hitting the right activities for the polar programs and trying to guide the community.

Dr. Steig asked about writing in a proposal that it is not going to have a major BI component for reasons such as building an instrument without anyone else's involvement; it will have no impact, but other proposals it will enable will have an impact. He added that underrepresented minorities are doing a lot of the work to increase diversity and questioned the dynamic of doing all the diversity work in a proposal. Dr. Jackson said proposals have to be evaluated on BI and intellectual merit. Not including BI means losing half of the ability to evaluate the proposal. He discussed having brought in students from community colleges and universities to work on helping build prototypes of instruments to get to the final product as one way to link a basic instrumentation development proposal to something that had an impact on students. Addressing the issue of the additional work placed on diverse communities, Dr. Jackson said one way to improve that is to build the population. It is necessary to be both strategic, i.e., the entire pipeline process, as well as tactical, i.e., direct, high-risk, high reward activities to make substantial changes.

Dr. Isern added NSF policy has two merit review criteria, BI and intellectual merit. Proposals cannot be accepted that don't have BI. She added that for FastLane, one could write in the box "none," and it would see it as a word and send it in, but it would be considered non-compliant and sent back. It's up to the POs; some programs have panelists do two ratings. It was previously possible to say the BI is that the instrument will benefit the science community. That's not enough anymore. Unfortunately, sometimes it gets interpreted as only education and panels have said there's no education component, so the BI are terrible.

Ms. Rom, the Polar Education Liaison, said it is true that people from diverse backgrounds do all the diversity work and this is recognized as an issue. There is an effort to support broader training within the community. Two Research Coordination Networks (RCN) are supporting the American Geophysical Union (AGU) and The Geological Society of America (GSA) and other societies to do training with the community around diversity, equity and inclusion and Justice, and Equity, Diversity and Inclusion (JEDI) issues. She also noted the Geosciences Opportunities for Leadership in Diversity (GOLD) program. There is a DCL out now for GOLD. There is also the Pathways into Geoscience (GEOPATHS) program. This is being looked at from different aspects, but in particular trying to have culture change within the community.

Dr. Falkner said there is a concern that when people get funded to do things, they're not doing them. That has been an issue for NSF, which is not a policing organization. The heart of a number of issues raised here is how well NSF is doing at making sure it isn't just put on the shoulders of the underrepresented groups to take care of getting them better represented. If a PI is committed to doing something and is funded to do it, what are they reporting on it and how is NSF responding to reports and are we sure they are using the funding in a way that was intended? There isn't a prescribed set of activities as to what BIs are. NSF wants creativity and innovation to improve the ability to make sure people are doing basic discovery and excellent research.

Dr. Steig said he was mostly asking about the communication to newer PIs and the community. People have their opinions about what BIs mean and is not sure they are the same as what is being expressing here. Dr. Falkner agreed that is an issue.

Dr. Arnaudo asked about the approval rate, the number of applications, and how many can be approved. He also asked if the application rate has been steady or increasing over the years. Dr. Jackson said that with the no deadlines process, there was a drop in the number of proposals submitted. With fewer proposals, there is a slightly higher rate of proposals being awarded. He said they are better proposals. A lot of groups across NSF have dropped deadlines and overall submissions have dropped by half. So, the success rate then goes up, which shows the success rate is not a valid metric and doesn't indicate what people want it to indicate. Dr. Falkner said NSF puts out a report with that information.

Dr. Weingartner asked about having a group of observers, perhaps young investigators from underrepresented communities, sit in on panels and see how the process works as a step towards promoting their own careers. Dr. Jackson said the best way for that to happen is for POs to recruit them to sit on their panels. It would be difficult to have people there that were not sworn in as part of the panel process.

Dr. Hayden said a number of the researchers don't have the space or ability to house those diverse students in a laboratory. And there's many other ways they can interact with that community. She encouraged them to consider ways to interact outside the laboratory in terms of their diversity and broader outreach to the community, including interacting with minority professional organizations, sharing their techniques and their outcomes with those communities.

NSF Response to Arctic Sciences Committee of Visitors Report

Dr. Sfraga; Dr. Quinn; Dr. Mercer

Before turning to the first item on the agenda, Dr. Falkner asked Ms. Short to speak briefly about the Antarctic and the community's desire to enhance bandwidth. Ms. Short said that in the past season new hardware was installed at McMurdo Station that is now being tested and a pilot is planned for next season to approximately double the station's bandwidth. After the initial testing, thought will be given to access and distribution on station.

Dr. Mercer thank the COV, chaired by Dr. Sfraga of the Woodrow Wilson Center, and the other members. The COV convened last year in June and the period of review was FY 2016 - 2019. It reviewed:

- 171 projects (= 259 proposals in eJacket due to collaborator proposals)
- 64 awards, 105 declines, 2 other (1xReturn Without Review and 1xWithdrawn)
- = ~26% of total actions taken during review period

Regarding panels, the COV recommended:

- ...that panels be implemented whenever possible...
- ...discourages the omission of panel discussions as there is evidence for conflicting statements in the reviews that may have been clarified through the panel summary.

In response, Dr. Mercer made the following remarks:

- ARC agrees about the value of panels.
- Some ARC programs make full use of panels as part of the review process.
- Using panels is not an agency requirement, but ARC will continue to consider the use of panels when appropriate and feasible. Many factors are considered when determining appropriate reviews, including number and complexity of proposals received, degree of interdisciplinarity of the proposed work and reviewer expertise needed, portfolio balance, dwell time, conflicts of interest, and the impacts on the reviewer community.

Regarding analysis templates, the COV recommended that ARC:

- ...should consider regularizing a review analysis template form...

Dr. Mercer said in response that:

- ARC has compiled a document identifying all "Suggested Elements" in a proposal review analysis. This effectively provides a template and guidance to aid POs in producing a thorough review analysis that contextualizes the proposal, summarizes the reviews and reviewer expertise, and addresses strengths and weaknesses in the proposal's intellectual merit and broader impacts. This template is now in use and is included in onboarding materials for new program officers.

The COV made a recommendation regarding the release of information beyond panel summaries:

- ...encourages POs to send PIs any additional information beyond the Panel Summaries and individual reviews that could shed light on the decision-making process.

Dr. Mercer provided a multi-part response:



- ARC POs routinely engage one-on-one with individual PIs to discuss their submissions, awards, and declines.
- This process of cultivating a research community may not be well-captured in the layers of documentation provided to justify the use of federal tax dollars, but NSF staff take great care in providing context for their decisions using PO Comments. NSF information policies restrict the type of information that can be shared with individual PIs, so PIs must look to their Context Statement to understand the field in which their proposals were evaluated.
- NSF also releases Dear Colleague Letters to the community to express interest in proposals that managing POs and leadership think would benefit the research community. Some recent examples include:
  - Research Coordination and Planning Opportunities for the Directorate for Geosciences (GEO) in Artificial Intelligence (AI);
  - Supporting Data and Sample Reuse in Polar Research;
  - Potential Support for Community Hubs for Collaborations Between NSF-funded Arctic Researchers and Arctic Residents

On the topic of deadlines and dwell time, the COV had two recommendations:

- ...encourages ARC to evaluate the impact of no-deadlines on submission rates, proposal quality, and the review process.

In response to this first recommendation, Dr. Mercer made two points:

- Based on NSF's previous experiences, ARC anticipated that proposal pressure would decrease. ARC elected to remove deadlines to accomplish three goals; reduce workload of POs, reduce pressure on the reviewer community, and provide PIs the opportunity to submit polished proposals.
- NSF is currently analyzing the impacts of no deadlines on programs, on proposers, and on the reviewer communities.

The COV's second recommendation on this topic was:

- ....encourages all possible efforts to decrease dwell times and to keep Investigators informed of pending decisions.

ARC also had a two-point response to this recommendation:

- As part of a pro-active approach to reaching dwell time goals, ARC program officers receive a monthly report on dwell times of all pending proposals.
- This report highlights proposals that are nearing the six-month mark and enables program officers to prioritize their work.

The COV also had two BI recommendations:

- ...believes a clearer articulation of broader impact expectations for each program should be made to the research community
- recommends that all POs clarify expectations of program-specific broader impacts (to PIs, reviewers and panelists), and communicate their role in the merit review process.

Dr. Mercer made the following four points in reply:

- This is a long-standing topic within NSF and the Foundation has generated several reference materials to aid the PI community in understanding what qualifies as Broader Impacts activities. Office of Integrative Activities (OIA) website serves as a gateway for these materials.
- All reviewers and panelists are provided resources on the Broader Impacts merit review criterion Review requests are linked with the explicit Foundation expectation for the BI merit review criterion outlined in the Proposal & Award Policies & Procedures Guide (PAPPG).
- The ARC section is disinclined to set additional ARC-specific expectations surrounding BI. This will ensure that PIs have the creative latitude to propose non-traditional BI activities and to tailor their proposed activities to the needs and expectations of their intended beneficiaries.
- We will consider increasing our efforts to point to materials to better educate the reviewer community on BI.

The COV also addressed diversity and inclusion and expansion of Doctoral Dissertation Research Improvement Grants (DDRIGs):

- ... encourage the program to increase the participation of minorities in the review process, particularly women and early-career scientists (post-doctoral and assistant-level professors/scientists).

In response, Dr. Mercer said:

- ARC continues to include early-career investigators and underrepresented groups, including Indigenous scholars, in the review process. ARC recognizes that more focused effort is needed to increase diversity in polar sciences and geosciences as a whole. We look forward to receiving the recommendations from the subcommittee on diversity and inclusion (D&I). ARC staff also co-lead the Interagency Arctic Research Policy Committee (IARPC) D&I Working Group, which encourages dialogue on increasing inclusion and equity in science. ARC created three new funding opportunities aimed at diversifying the Arctic research community and/or increasing inclusion of Indigenous communities in Arctic research:
  - DDRIG solicitation is aimed at supporting diverse students pursuing polar research;
  - DCL: Potential Support for Community Hubs for Collaborations Between NSF-funded Arctic Researchers and Arctic Residents encourages proposals that increase collaborations between researchers and communities in the Arctic, with an emphasis on Indigenous communities; and
  - Postdoctoral Research Fellowship solicitation encourages research proposals that demonstrate evidence that the recipients will diversify the breadth of polar research and bring perspectives to the polar community that arise from their experience with groups that have not traditionally participated in OPP-funded polar research.

The COV also:

- ...recommends ARC consider an expansion of DDRIG support across all programs

Dr. Mercer responded:

- ARC agrees and had already begun the clearance process for the new DDRIG solicitation at the time of the COV that formalizes the solicitation for DDRIGs and expands the opportunity to Arctic Observing Network (AON) and Arctic System Science Program (ARCSS).

The COV also made a recommendation that ARC consider the Portfolio Review Committee recommendations:

- ...reorganize into three sections: Natural Sciences and Systems (NSS), Social Sciences and Systems (SSS), Coupled Human-Natural Systems (CHNS). Combine ANS and ARCSS, COV encourages clarification of ARCSS

The response was:

- ARC will consider this during an upcoming Section retreat.
- The 3 designations do not necessarily capture all types of research funded by ARC. ARC recognizes the intention to reduce barriers across programs and increase interdisciplinary research, other approaches will also be considered.
- Changing the program names and purpose would require careful consideration to ensure the research community is not dissuaded from submitting proposals by the change. A change to program names and coding would also create internal challenges for comparing data year-to-year. If a change is implemented, it must be well-justified, well-designed, approved by NSF leadership and include sufficient outreach to the research community and stakeholders.

The COV's AON recommendation was:

- ...encourages continued specific planning for AON...recommends that ARC form an external (or internal to OPP) advisory committee to evaluate...AON...and ... develop a strategic plan.

The response was:

- Given the multidisciplinary range and societal value of sustained Arctic observing efforts, ARC acknowledges the importance of maintaining and strengthening the AON program and related activities.
- ARC agrees with the need to develop a strategic plan for the AON program and to aid the cognizant PO in its design and implementation. ARC has begun internal deliberations to develop a pathway for soliciting input from the research community, relevant stakeholders, and end users of Arctic observing products; for identifying and prioritizing Arctic observing needs to enhance the AON program's portfolio; for leveraging NSF cross-Directorate programs, interagency collaborations, and international initiatives; and for communicating the resulting strategic plan to research communities and the general public.

Regarding engagement with the research community and connecting awards to larger Arctic priorities, the COV:

- ...recommends that Program Officers continue to facilitate planning and community discussion workshops and town hall meetings (e.g., at AGU)...

- ...recommends that ARC maintain and enhance its participation in national and international Arctic research coordination activities, and that it also encourages community participation in these efforts.

Dr. Mercer responded:

- The ARC Section spends significant time on engagement with the polar research community and this will remain a priority. Examples:
  - Leadership in IARPC: developing the next 5-year Arctic Research Plan (ARP), Co-leadership of Collaboration Teams
  - Involvement and contributions to Arctic Council Working Groups
  - Office Hours, Dear Colleague Letters, NNA PI meeting, AGU booth, Arctic Science Summit Week (ASSW), open houses, panels, training
  - Lead US member organization in and currently chairing the Forum of Arctic Research Operators (FARO); membership and currently chairing the federal-only Board of the interagency United States Arctic Observing Network (US AON); national representation on the Sustaining Arctic Observing Networks (SAON); and planning for a workshop on trans-national access to Arctic research infrastructure

In conclusion, Dr. Mercer thanked the COV members and expressed appreciation for its acknowledgement of Arctic Sciences' efforts to ensure the integrity of the decision-making process, improve representation among reviewers, engage with the scientific community and work across directorates at NSF and the section to maintain those practices.

### *Discussion*

Dr. Mack said ARCSS is an intellectual model program for Arctic research that's produced important work that has been incredibly important to the community she works with and questioned the recommendation calling for clarification. Dr. Sfraga said the COV did not view the program as broken. The COV was looking for refinement and clarification. Everybody understood fully the work going on and how important it was. Nothing is broken, it was trying to raise issues so leadership could think about these in a different way and these recommendations were reflections of communities, not just the COV. Dr. Mercer added that ARC was pleased with the report and had engaging conversations with the COV and that is reflected in the report.

Dr. Strawhacker said the blurry line between Arctic System Science and Arctic Natural Science exists for a reason. It helps to not miss good science that might not be a clear fit between those two programs. There is constant communication to make sure PIs know where their proposal should go, because there's often not a clear fit. Dr. Anderson added that it was a philosophical question. Trying to have complete clarity and not have a fuzzy boundary between the two programs risks a crack that no one should fall into; better to have some overlap and have projects that could go in both places for which there can be co-reviews or discussions among programs. A lot of time is spent having dialogues with PIs, he said, about where might be a good fit and there is a richer connection with the community and a better set of science out of the structure.

Dr. DeGrandpre asked if it is correct that the portfolio review suggested eliminating AON but then the COV supported AON. Dr. Mercer said that was a correct interpretation. Observing is important on the global stage and preserving and expanding observational programs is a topic for the upcoming Arctic science ministerial.

Dr. Nettles said it wasn't that the portfolio review wanted to eliminate the type of work that AON supports, but the programmatic rearrangement had different ways of cross cutting themes. Long-term observations were one of the things that cut across the suggested new programs. They were going to ask proposers to identify in which box their work makes sense. Long-term observing is critical. The portfolio review didn't want to eliminate the idea of it, just change the programmatic structure.

Dr. Steig endorsed not being too prescriptive about BI. If you're prescriptive, then the creativity disappears.

Dr. Mercer returned to the comment from Dr. Nettles, adding that having cross cutting themes is a topic in other platforms as well, including the new five-year plan for Arctic research. But she did not want to confuse the research community or have them be discouraged because something's missing in a program.

Dr. Mercer agreed with a chat comment that there's tremendous value in having early career researchers or underrepresented groups gain experience by observing panels and said she is not opposed to the idea. She thought it warranted a broader discussion at the agency level.

Dr. Heimbach said in reference to AON that on the European side they are looking across the Atlantic and awarding new programs and projects and are including alignments with other non-European programs. He asked if in the U.S. that is taken into account. Dr. Mercer clarified that the question was about AON's strategy in relation to European efforts in observing and responded that there have been conversations with European counterparts on observing. She is speaking from the programmatic level within the research community up to the national and international level. That ties into Arctic Council discussions and discussions within the European Polar Board. Dr. Strawhacker added that the big challenge for POs at NSF is foreign funding restrictions in their role as POs.

Dr. Stieglitz said panels are selected not just for expertise but for folks at small and large schools, for young panelists and for experienced panelists, looking also for gender and diversity. The panel is partly a learning experience for everyone. He said it is an interesting idea to have observers but didn't know how it would work.

Dr. Kuklina asked about data sharing and where data should be submitted and whether there is coordination between different agencies. Dr. Pope said there is a DCL about NSF data policy. Requirements are that data are in long-lived archives and metadata are reported in the Arctic Data Center. One could submit to Pangea and give the metadata to the Arctic Data Center. You could put the data in multiple places, although that might get a little confusing. The Arctic Data Center invests in user services to have conversations about different options. He suggested asking the PO for suggestions around best practices. He discussed the problem of making it not

matter where you put data. The more relevant questions, are: Am I adding the right metadata? Am I curating the data properly so that it becomes easily discoverable and more reusable in the future? Dr. Kuklina said the Arctic data Center workshops were helpful, but they were general and did not address her specific questions. She suggested specific workshops for specific projects and helping social scientists understand how to work with data. Dr. Pope added that one of the focuses is going to be increased engagement with the Arctic social science community.

Dr. Hindle asked about the use of panels. She said the response nicely laid out the details that go into making the decision to form a panel or not and asked for clarity on whether that response should be taken as viewing the ARC's current actions on forming panels as sufficient or if there are plans to do anything differently. Dr. Mercer responded that it can be discussed at an upcoming self-assessment through a series of retreat meetings. She added that there is work being done between Arctic and Antarctic and holding panels together on certain disciplinary topics; glaciology is a good example. That allows for making sure there is a sufficient number of proposals to pull a panel together with the right expertise periodically and assess those proposals in that light. There is an effort to do more of those types of things across OPP, which would help expand the use of panels where they wouldn't have always been used in the past.

Dr. Crowell referred back to the Arctic Data Center and asked about the connection between Arctic Observing Network data and the Arctic Data Center. AON data needs to go to a recognized national data center, but does it all go into the Arctic Data Center? A problem with that program is the extent to which it is a network and the discoverability of the data, what studies have been done where and what information was produced. He asked if there's an effective connection between AON and the Arctic Data Center. Dr. Mercer responded that AON follows the same data policy as the rest of OPP, with the caveat that data be made readily available. AON also supports the [Arctic Observing Viewer](#), an online platform that is a searchable database of all observing networks across the Arctic, though it doesn't have a lot of visibility. That platform is being reviewed to see what might be done in terms of viability and visibility. That is the missing link, perhaps.

Dr. Bartlett said the response to the Arctic COV included a comment related to BI that had to do with Advancing Research Impacts in Society (ARIS) and asked how PIs access information from ARIS. If it is intended to advance the rigor, relevance, and practice of BI, the community wants to know about that. Ms. Walker said ARIS has training opportunities for the community that can help elevate awareness on BI and there are resources available to PIs to work with that group to put together their strategies on BI. Dr. Bartlett asked how to find out about the workshops and Dr. Pope provided the [link](#).

Dr. Mercer said there was strong agreement on the COV on reinstating panels as much as possible. The response agreed with the value of panels and consideration is being given to where they can be used and how to work with other programs to hold disciplinary panels and expand their use.

Dr. Crowell said he strongly supports efforts to increase the use of the Arctic Data Center. There's potentially data from many projects that were not under AON grants that have AON type data and that could go into the Arctic Data Center.

Dr. Stieglitz noted that ANS holds panels. About 30 percent of the portfolio is co-reviewed by other panels. Many proposals are taken to two or three panels at once. He also brought up the distinction and the boundaries between some programs. The Arctic is a place, not a discipline. It's not like going to a program in math or physics. ANS does terrestrial, atmosphere, oceans, rivers, physics, chemistry, and biology. We have boundaries, but because of the way we operate, the boundaries are moving and we're always sharing proposals between the programs when it fits, so there are reasons to not draw specific distinctions between some of the programs.

Dr. Sfraga said the COV spent a lot of time talking about panels. Regarding AON, its importance was underscored over and over again. That's an area seen as important for now, but also understanding the difficulties trying to put together a strategy that looks across all disciplines; many communities have equities in that program, nationally and internationally. It was so essential to the work of the community that it took a lot of discussion to figure out how to provide our voice to say: On the right track, very important, just going to grow in importance. There was a long discussion about a strategy going forward knowing these are multi-year, big money, lots of equities, very complicated. On the refinement of programs, it is a place, not a discipline, but how can we best communicate. On the importance of the community engagement, that was seen, recognized and celebrated by the committee. With a growing interest in the polar regions, it was encouraging that that engagement continue to happen. As noted, the Arctic has people that live and work there. To the degree this engagement can continue, building on the many years of doing it, it's a value add.

Dr. Hill said the relationship between social science data and the Arctic Data Center are at the top of the list. There was a big workshop last year. And every two weeks, there is a meeting with the Arctic Data Center to talk about initiatives to support and educate the social science community on best practices and strategizing how to get input from that community on what they need in terms of education and training materials to help them be more sophisticated data providers and users. The Arctic Data Center's ready to turn its attention to this and it is hoped its visibility will increase in the social science community.

#### Discussion of the Subcommittee for Diversity and Inclusion

Dr. Hofmann; Dr. Hayden; Ms. Walker

Dr. Hayden said the subcommittee charge was to:

- Characterize the current state of diversity of the NSF sponsored polar research community
- Examine efforts by NSF and others to enhance diversity and inclusion
- Identify and recommend the most promising strategies for OPP to pursue to significantly enhance diversity and inclusion in the polar sciences in both near and long-term.

She also discussed supporting efforts:

- OPP works with the sub-committee to arrange and host a series of learning activities regarding a number of past and present NSF sponsored efforts aimed at increasing diversity and inclusion.

Dr. Hayden introduced the subcommittee membership, with brief bio-sketches, before turning to a summary of the six learning activities to date:

- GEO Broadening Participation efforts
  - Brandon Jones & Lisa Rom
- MSI Report
  - Anne-Marie Nunez
- Alaska Native Science and Engineering Program (ANSEP)
  - Herb Schroeder
- CEOSE
  - Ryan Emanuel
- Infusing Diversity into Arctic & Antarctic Programs
  - Linda Hayden
- OPP Efforts
  - OPP Program Officers

She then discussed each of the activities in detail as well recommendation considerations the Sub-Committee is contemplating after learning about current efforts:

#### GEO Broadening Participation efforts

- Research Experiences for Undergraduates (REU) Program: Connect REU Students to Graduate Programs as a Strategy for Broadening Participation
  - Recommendation considerations: more REU sites with polar focus. Also considering a virtual component to all REU programs to help with diversity.
- The NSF Graduate Research Fellowship Program: Relatively high percentage of under-represented applicants.
  - Recommendation considerations: 1. Polar scientist to work with undergraduates to complete applications for the Graduate Research Fellowship Program (GRFP) program. 2. Develop a program that connects all the GEO GRFs into a cohort and provide them with mentoring and training in polar science
- Postdoc Programs: Opportunities across NSF Directorates or Division level
  - Recommendation considerations: Develop an OPP Postdoctoral program
- Dear Colleague Letter
  - Recommendation considerations: Encourage the polar community to consider partnership.
- Other programs discussed
  - Inclusion across the Nation of Communities of Learners that have been Underrepresented for Diversity in Engineering and Science (INCLUDES)
  - GOLD
  - GOLD pilot project
  - Geoscience Opportunities for Leadership in Diversity - Expanding the Network (GOLD-EN)
  - GEOPATHS
  - Next Generation of Polar Researchers:
  - Leadership Symposium 2015 and 2019
- Question generated: How are we measuring success in STEM beyond getting a STEM degree. What do successful results look like? This could be time based.



### Minority Serving Institutions Report

- The US is becoming increasingly diverse.
- Majority of targeted students are at MSIs. The nation has a responsibility to invest in MSIs.
- MSIs share an INTENTIONALITY calculated method of engagement.
- Seven Effective Strategies
  - Dynamic, multilevel, mission-driven leadership
  - Institutional responsiveness to student needs
  - Campus climates that support a sense of belonging for students
  - Student-centered academic and social supports
  - Effective mentorship and sponsorship
  - Undergraduate research experiences
  - Mutually beneficial public- and private-sector partnerships
- Experiential education is particularly relevant to Polar (NSF GEOPATHS)
- Lots of learning at professional conferences and virtual experiences
- Barriers to Field Work: cost, gear and time for working students.

### Alaska Native Science and Engineering Program

- ANSEP students go from 8th grade to a STEM BS degree in 5 years.
- Efforts to home grow native engineers met with fears that they would have to dumb down the degree program. Students were both academically and socially unprepared. Traction came through pre-college (middle school and K-5) outreach.
- Increase funding for middle school programs

### Committee on Equal Opportunities in Science and Engineering

- Early CEOSE recommendations
  - Diversifying NSF staff and management
  - Improving accessibility of NSF-supported workplaces and meetings
  - Strongly enforcing the Broader Impacts merit review criterion
  - Building capacity at Minority-Serving Institutions
  - Examining structural inequities of cost-staring
- Key Takeaways from CEOSE Members
  - Broadening Participation is a solution, not a problem to be solved
  - Seeking to emphasize power in the accumulation of knowledge - stop reinventing the wheel with our BP/DEI approaches, programs and lessons learned
  - Accepting that BP/DEI requires a mindset change for many people
  - Everyone is accountable - The underrepresented are not solely responsible for championing diversity.
- Synergistic Opportunities: What can we learn from each other?
  - How can CEOSE highlight insights and lessons from OPP-SC?
  - What can OPP-SC learn from other areas of NSF, CEOSE, etc.
  - What challenges do we share? Unique aspects of OPP?

### Infusing Diversity into Arctic & Antarctic Programs

- The Center for Remote Sensing of Ice Sheets (CRISIS) Instance of the Model

- Partnership: Significant involvement of MSIs and Minority Professional Organizations. (Association of Computer Science Departments at Minority Institutions (ADMI), Haskell, The Elizabeth City State University (ECSU)) with appropriate budget inclusion. Gave them a voice.
- Access points for beginners and all students. Eight-week training at ECSU; AY training at Haskell; Internships at all partner sites. REU site for pre-service teachers.
- Field Opportunities: Juneau (Juneau Icefield Research Program), Norway (Brathay Exploration Group), Greenland, West Antarctic Ice Sheet (WAIS), etc.
- Distinguished Lecture Series and Seminars: Held at Haskell and ECSU
- Minority Professional Organizations (MPO)
  - MPOs have long been committed to mentoring and nurturing the professional development of underrepresented students. They provide a rich source of expertise and commitment. Consider Partnership with these Minority Professional Organizations. Give the MPO or MSI a voice in constructing the partnership. It will not be successful otherwise.

#### OPP Efforts

- Overview of Integrated Program JEDI Efforts
  - Alignment across NSF: Improving Readiness: PO training, policy development, training
  - Community Engagement with grantees and the scientist community, town hall meetings targeting early scientist and grantees, social media presence.
  - Emphasizing broader impacts, with the language in award letters and stressing the importance of OPP diversity efforts. Have the same consistent message.
  - Field Deployments: safe, supportive and inclusive situation
  - Grantee Reporting: Looking for actual evidence of their diversity efforts. Look for actual evidence of diversity efforts. Beginning to return reports that do not have BI outcomes equal to research.
  - Internal Assessments and Training. Looking at the diversity success or lack of success within of certain programs
- NSF 20-112 Dear Colleague Letter Potential Support for Community Hubs for Collaborations between NSF-Funded Arctic Researchers and Arctic Residents
- NSF 20-597 Arctic DDRIG, Arctic Social Sciences, Arctic System Sciences, and Arctic Observing Network
- Interagency Arctic Research Policy Committee Diversity & Inclusion Working Group has interesting events coming up
- Interagency Arctic Research Policy Committee has released The Draft Arctic Research Plan 2022-2-26. They Welcome Input on Diversity
- Respectful and Meaningful Engagement
  - Principles for Conducting Research in the Arctic
  - NSF Director's Town Hall with trial Leaders, April 6, 2021, at 1:00pm EDT

Dr. Hayden continued the presentation, filling in for Dr. Hoffmann, who was unable to attend, turning next to:

- Future Learning Activities

- May 13th Continue conversation with OPP PO's on questions from the Subcommittee
- May 27th Learning Activity Focused on the Culture Climate (Bec Batchelor)

Discussing the structure for the final report, Dr. Hayden provided the following updates:

- Subcommittee has developed a draft report structure.
- Deep expertise on the Subcommittee assists with the breadth and focus of all the recommendations.
- Plan for continued work through the summer.

She also showed how the draft is currently organized:

- Executive summary
- Rationale for the report
- Overview of state of DEI in OPP
- Organizational and institutional culture and climate for underrepresented minorities (URMs)
- Examination of successful practices and inclusive cultures
- Perspective and insight from other successful efforts
  - Programs (e.g., other institutions, or agencies)
  - Engagement strategies at MSIs
  - Scientific societies

In conclusion, Dr. Hayden presented a brief preview of the subcommittee's recommendations:

- Integrated synthesis of best practices, successful efforts
- Will scale with time: e.g., long-term and short-term actions
- Metrics of success
- Contextualized re: culture and institutional perspectives

### *Discussion*

Dr. Crowell commended Dr. Hayden and Dr. Hoffmann for their leadership and suggested putting Dr. Hayden's presentation online. He said the emphasis is on education, expanding diversity in the whole pipeline and the pathway to what is measurable at NSF, which is the proposals coming in. The focus is on the whole educational process and into the professional world.

Dr. Steig said it had been a great learning experience. There is slow and deliberate movement in a really good way. Dr. Falkner said she did not think the subcommittee was moving slowly. She said there are recordings of sessions Dr. Steig or others had to miss that are available to the AC.

Dr. Mack said her school became a minority serving institution in March and the report's timing will help envision the role of people working in polar sciences and how to move forward. The community of researchers can benefit from this, and she suggested outreach to other minority serving institutions in the polar sciences to think about how to move forward in a positive way. Dr. Falkner said the recommendations would be to OPP but pertain to the entire community.

Dr. Weingartner commended the subcommittee and Dr. Hayden for a comprehensive overview and asked if there are other ACs doing something similar and, if so, should there be any attempt to compare findings. Dr. Falkner said that had to be researched. Dr. Crowell said GEO was going to do something similar and the two ACs should keep track of each other's efforts. Dr. Stammerjohn said it was featured in the draft report AC-GEO is working on. She said it's close to final and can be shared soon.

Dr. Falkner reminded the AC of its meeting with Dr. Brandon Jones, from the GEO front office, who's one of the lead people for the agenda efforts and the front office is also conducting learning activities. Dr. Lina Patino, who has been attending the learning activities, is also going to be a key person for that.

Dr. Steig asked about the process for becoming an MSI. Dr. Falkner said it's a definition that pertains to enrollment for certain underrepresented groups and Hispanics for Dr. Mack's institution, but there's a good description in the minority serving institutions report that the National Academy conducted. Dr. Hayden said some are designated that were historically minority serving. Most are designated that way because of their enrollment. Dr. Falkner said there is not a uniform definition. There is a different way to define Historically Black Colleges and Universities (HBCU) compared to a minority serving institution.

Dr. Bartlett asked about the need for folks from underrepresented groups to have sustained research experiences. He said often graduate student applicants who haven't had a sustained research experience have had interesting REU experiences that have gotten them inspired and helped them go down the science path for more advanced training. He added that if community colleges are made tuition-free, that may be an opportunity to plug more diverse groups into research environments.

Dr. Hayden agreed that it takes more than one dose of the medicine to make the change you want made. You've got to build on those experiences, which is why she took issue many times with programs that would not allow students to repeat their participation in the program. She has students in her program this summer who were coming back as mentors and assistants. That is all going out on internships. It is important to continue that development with them. Don't think one exposure to polar science is going to do it. They are going to need a lot of help for a long time to get the product you're looking for.

Dr. Falkner said community colleges are indeed a very important way to tap into underrepresented groups and there are community college-oriented programs at NSF, with specialized POs who deal with them and the AC may want to have them speak to the committee.

Dr. Nettles asked about where the committee's thinking is with respect to metrics. One of the things NSF can measure is who is writing proposals and getting proposals funded and yet STEM is much broader than people who have Ph.Ds. and write proposals to NSF. It would be a great success if there are other career paths, other than becoming a professor. How do you judge impact when it may not be that your success is reflected in proposals to NSF, it's reflected in all the people who have bachelor's or master's degrees in civil engineering and are working in the field but aren't writing a proposal to NSF.

Dr. Hayden said the committee recognizes the need to come up with a way to determine success that is not restricted to proposals. They haven't seen much data yet, but have some indication that there are holes in that data set, that they will have to recommend that data be collected in a different way or some other data be collected that is not currently being collected. The committee has had many discussions about the measure of success.

Dr. Falkner said the committee got kicked off with Ms. Walker and Dr. Arnold doing their best to comb available datasets at NSF to get a quantitative handle on what's going on. It is difficult to get information on demographics because self-reporting is voluntary. One of the trends seen at NSF writ large is fewer people providing that information. When talking about statistics of small numbers, it can be a significant gap. That said, they did their best to try and pull together what there. The committee then had lots of questions. She referenced a science paper in *Nature Geoscience* written by graduate students who combed available data from the National Center for Science and Engineering Statistics that NSF has to get a handle on diversity in the geosciences. The problem is, we're not strictly geoscience and polar. It's a slice and dice and it doesn't make sense of things overall. That report suggested that for the geosciences writ large there was, at some level, beginning to be parity in male-female feeds up to the postdoc level of the pipeline. But that's not true for polar; it's more like 25 percent of the population is female that are funded. OPP can support activities that don't necessarily produce somebody who's going to write a proposal, but we would like to see the community submitting proposals be diverse as well. Dr. Falkner said there is a need for a citizenry well educated in science and more appreciative of it. Getting a handle numerically on how the things being funded affect those things is a lot harder ask.

Dr. Kuklina said Arizona State University conducted research about community engagement. That maybe one of the ways to find statistics. She also suggested looking at how many papers funded by NSF have some diversity. Dr. Falkner said the community has the ability to write proposals to us to be funded to support that kind of work.

Dr. Falkner thanked Dr. Hayden for the presentation and said the momentum is rewarding and though she won't be around to see the end product directly, she will be watching from afar and hopes the committee is very successful.

#### Action Items, Closing Remarks and Adjournment

Dr. Weingartner; Dr. Falkner

Dr. Falkner directed members to [The National Science Foundation's Merit Review Process; Fiscal Year 2019 Digest](#) in response to the discussion earlier about success rates and to the [OPP budget request narrative](#). Information was also provided on the location of the OOI South cable (~55S, 90W) in response to an earlier question from Dr. Weingartner. It was also noted that much of the array was removed and not redeployed in 2019. All data from 2015 to 2020 is available on the OOI website.

Dr. Pope responded to a written question about OPP's continued support of open data access and community concerns about possible changes. As of now, the intention is to continue to support

open data, fair data and care data, which he put in terms of findable, accessible, interoperable and reusable data, and the care principles for indigenous data. Continuing to make data more fair and care compliant into the future aligns with NSF-wide policies and commitments. Beyond the sharing of data and metadata that OPP requires, there's requirements for making publications open and reporting those publications. Also, there's a database where PIs are encouraged to upload those publications to make them publicly available. Also, he directed the AC to public access for [results of NSF-funded research](#) and to the [NSF Public Access Repository](#) (NSF-PAR).

Next, Dr. Stammerjohn provided a summary of AC-GEO activities. The spring meeting was the last for Dr. Easterling and Dr. Hodges and the AC expressed its appreciation to both. The AC discussed COVID impacts with a thorough analysis of the data for how COVID has impacted funding, productivity and equity. There were strong inequities and impacts. Those with responsibilities at home were more impacted. But it was difficult to assess with available data. There's a challenge getting good data. In addition, Dr. Easterling gave an overview on the National Academy report that has been solicited advising NSF on how they might approach system science in a more integrated fashion. There was also a subcommittee [report](#) from Earth Sciences, which reviewed seismology and geodesy. The last chapter is on JEDI and equity, inclusion and diversity for access. In this final review, the AC included that as one of the priorities. AC-GEO also discussed its forthcoming successor report to *Dynamic Earth*. It focuses on the importance of geoscience research and issues that deserve more attention, including JEDI, optimizing the support structure of NSF, diversity of panels and bias in the review process, fair review of high-risk proposals and timely reporting of funding trends. Finally, there was a joint session with the Directorate for Biological Sciences (BIO) to brainstorm on how the two divisions can be better coordinated to do integrated or System Science, including transdisciplinary science.

Dr. Falkner noted the parallel concerns and interests between the two ACs. The document that AC-OPP wrote summarizing extant Academy and other reports governing OPP priorities has proven useful and GEO's approach and OPP's are mutually beneficial.

Dr. Falkner thanked everyone and noted the AC will next meet with a new chair and a new person in her role. In addition, several members will rotate off. With the pandemic, she had asked members to consider staying for an additional year, but now the AC will resume its regular rotation.

Dr. Weingartner and AC members suggested possible agenda items for future meetings:

- Cyber security (Dr. Weingartner)
- An update on Antarctic ships (Dr. Weingartner)
- A joint session between ACCI and OPP (Dr. Weingartner)
- Building research resilience for U.S. scientists with projects in Russia (Dr. Mack)
- Results of a COVID-19 impacts survey (Dr. Loose, who will determine if results will be ready in time for the next meeting).
- The security of Federally funded research while maintaining dynamic international collaborations (Dr. Nettles).
- Proposals for helping OPP and the research community with added workload due to COVID-19 (Mr. Iselin).

- Possible plans to restructure OPP (Dr. Stammerjohn).

On behalf of the committee and the community, Dr. Weingartner thanked Dr. Falkner for her leadership and wisdom and also thanked her staff. Dr. Falkner also praised her staff and thanked Dr. Weingartner for his leadership and active involvement in subcommittee work and thanked the committee. In closing, Dr. Falkner passed on advice she'd been given on leadership early in her career that has been helpful to her over the years and adjourned the meeting.