

**FY 2020 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

Date of COV: April 28-30, 2020
Program/Cluster/Section: Antarctic Sciences (ANT)
Division: Office of Polar Programs (OPP)
Directorate: Geosciences (GEO)
Number of actions reviewed: 283 (151 projects, which group collaborative proposals into one project) 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)
Total number of actions within Program/Cluster/Division during period under review: Awards: 399 (competitive proposals, subject to external review) Declinations: 1,054 (competitive proposals) Other: 52 (Returned Without Review of competitive proposals); 308 (non-competitive proposals including EAGER's, RAPID's, Supplements, workshops, etc.)

Manner in which reviewed actions were selected:

The complete list of actions from which the samples were taken was obtained from the NSF Report Server database (the official data warehouse of NSF proposal and award information) via NSF's Enterprise Reporting. This included all of the Antarctic Sciences Programs' actions on competitive proposals (awards, declines, and others) with a DD Concur (Division Director Concur) date during the COV evaluation period, fiscal years 2016-2019 (10/1/2015-9/29/2019). Non-competitive actions such as IPA/Rotator grants, supplements, forward fund actions were removed resulting in the total of 1,453 actions on competitive proposals.

To create the COV sample set, the proposals were enumerated sequentially based on DD Concur timestamp. Then, 5% or more of the proposals from each ANT program were selected using a random number generator and aiming to roughly represent a typical Award/Decline funding rate of ~30%. When available, 1-2 of each Return Without Review and Withdrawn proposals were randomly selected. Additionally, 5 non-competitive alternate proposal types were randomly selected including Supplement, RAPID, and EAGER proposals.

The data were consolidated into the "ANT Authoritative Reference Dataset" and used for subsequent data analyses and summary statistics available to the COV committee.

COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	Lee Kump	Pennsylvania State Univ.

COV Members:	Amy Barger	Univ. of Wisconsin Madison
	Rebecca Bendick	UNAVCO
	Ginny Catania	Univ. of Texas Austin
	Sarah Gille	Univ. of Calif. San Diego-Scripps Inst. of Oceanography
	Matthew Lamanna	Carnegie Institute
	Michelle Mack	Northern Arizona Univ.
	Eric Post	Univ. of California Davis
	Marco Tedesco	Columbia Univ. Lamont-Doherty Earth Observatory
	Bess Ward	Princeton Univ.

MERIT REVIEW CRITERIA

An understanding of NSF's merit review criteria is important in order to answer some of the questions on the template. Reproduced below is the information provided to proposers in the Grant Proposal Guide about the merit review criteria and the principles associated with them. Also included is a description of some examples of broader impacts, provided by the National Science Board

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities. These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. ([PAPPG Chapter II.C.2.d.\(i\)](#) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including [PAPPG Chapter II.C.2.d.\(i\)](#), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to:
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

3. Examples of Broader Impacts

The National Science Board described some examples of broader impacts of research, beyond the intrinsic importance of advancing knowledge.^[2] “These outcomes include (but are not limited to) increased participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education at all levels; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a globally competitive STEM workforce; increased partnerships between academia, industry, and others; increased national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Investigators may include appropriate outcomes not covered by these examples.”

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process.

Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments:</p> <p>In general, ANT utilizes <i>ad hoc</i> reviews followed by panel review (in-person, virtual or hybrid) appropriately. The reduction in proposal pressure since the elimination of deadlines has led to a shift in procedure, with some programs reducing the number of panelists, shifting to virtual panels only, using other Divisions for panel review, or eliminating panel review entirely.</p> <p>Commendations:</p> <ul style="list-style-type: none"> · The number of ad hoc reviews received per proposal exceeds the NSF expectation of 3 in all but 2 programs (AOE and AOAS). · The shift to a majority of virtual panels (Fig. 10 in self-study) is viewed favorably by the COV. 	<p>YES</p>

<p>Recommendations:</p> <ul style="list-style-type: none"> · The abandonment of panel review (self-study Fig. 7) by a fair proportion of the programs (21% in 2019) raises some concerns. The COV feels that panel review is important to helping the POs manage portfolio balance, given their broader exposure to the variety of submissions that the individual ad hoc reviewer doesn't have. We recommend all programs to strive to incorporate panel review into their merit review process in addition to maintaining ad hoc reviews. · The committee recognizes the extent to which the POs require flexibility in how they solicit reviews, but the committee sees that there could be significant benefit to holding more virtual panels including increased opportunities for broader participation (e.g., by single parents, faculty with heavy teaching loads) and, when well moderated by the PO or delegate, more balanced participation by panelists (less likely to be dominated by strong personalities). On the other hand, the loss of opportunities for networking and chance scientific encounters is reduced. Savings from shifts to virtual panels might be redirected to creative, alternative in-person activities that provide these otherwise lost benefits. <p>Data Source: Summary data and Self Study in eJacket COV Documents</p>	
<p>2. Are both merit review criteria, 1) intellectual merit and 2) broader impacts, addressed?</p> <p>a) In individual reviews?</p> <p>b) In panel summaries?</p> <p>c) In PO review analyses?</p> <p>Comments:</p> <p>By and large, both criteria are well addressed by the individual reviews, panel summaries, and PO review analyses. Broader impacts (BIs) tend to get a more cursory review, especially by the panels, somewhat by the ad hoc reviewers, but never by the POs. COV noted only a few cases where proposals presented and/or reviewers assessed the results from prior BI activities. COV also expressed concern that PIs, especially in sole-PI or single co-PI projects, usually don't have the expertise to propose, conduct, or assess the impact of BI activities.</p>	<p>YES</p>

Commendations

- POs do an excellent job of presenting summary evaluations of both criteria in their reviews and communications with the PIs.
- The use of the template in panel summaries helps ensure that panels address both criteria, although there's a sense that the BI section is less thoroughly addressed.

Recommendations

- NSF should clearly indicate that PIs should budget for BI activities that are not covered in standard budget categories such as student support.
- 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.
- NSF should consider adding BI experts to panels, especially when large, expensive proposals are being evaluated.
- Reviewers and panelists should be instructed to have higher expectations for more expansive and innovative BI activities in large, expensive proposals.
- ANT should consider showcasing especially impactful BI activities, and provide a handbook/website with exemplars of BI activities.

Data Source: Jackets

<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Comments:</p> <p>Overall the COV was impressed with the care and thoroughness the <i>ad hoc</i> reviewers put into their reviews. There were some exceptions noted, but in those cases the panel and program officer (PO) addressed those deficiencies. The number of <i>ad hoc</i> reviews seemed to vary quite substantially within and among programs. The COV notes the challenge faced by POs in ensuring significant numbers of reviews, given the current NSF system of soliciting reviews that makes it impossible to predict what fraction of solicited reviews will be provided.</p> <p>Commendations:</p> <ul style="list-style-type: none"> · The ANT community in general is providing outstanding, constructive reviews on proposals. · POs are putting in good effort in soliciting reviews. <p>Recommendations:</p> <ul style="list-style-type: none"> · NSF should revamp its reviewer solicitation and tracking system to one similar to that of many journals that allows for automatic confirmation or declination of the request. Such a system would allow POs to solicit additional reviews if needed and maintain the expertise and gender/ethnic/racial diversity of the reviewer pool, and would allow those declining the invitation to suggest alternate reviewers. <p>Data Source: Jackets</p>	<p>YES</p>
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<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p> <p>In general, panel summaries provided good rationale for the panel recommendation. We noticed a few instances where a lack of consensus among panelists was noted. There was a tendency for more thorough explanations of positive recommendations than negative ones.</p> <p>Commendations:</p> <ul style="list-style-type: none"> · Panels in general are doing their jobs well, reflecting good PO oversight. <p>Recommendations:</p> <ul style="list-style-type: none"> · ANT POs should encourage their panels to provide more thorough rationales for proposals that are unlikely to be recommended for funding. <p>Data Source: Jackets</p>	<p>YES</p>
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), PO review analysis, and staff diary notes.]</p> <p>Comments:</p> <p>The COV came away very much impressed with the care POs are taking in their decision-making and documentation and communication of those decisions. When the PO's decision diverges from the panel recommendation, they are presenting clear and thorough explanations of why. The review analyses were exceptionally thorough.</p> <p>Commendations:</p> <ul style="list-style-type: none"> · POs are doing an outstanding, thoughtful job and communicating their decisions very well. <p>Recommendations:</p>	<p>YES</p>

<ul style="list-style-type: none"> · ANT should find a way to convey to their investigator community the outstanding job their POs are doing with their attention to detail and professionalism. · New PIs should be encouraged to build professional relationships with these outstanding individuals. <p>Data Source: Jackets</p>	
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<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>[Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the PO (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]</p> <p>Comments:</p> <p>As discussed above, the POs are doing an outstanding job of communicating with PIs.</p> <p>Data Source: Jackets</p>	<p>YES</p>
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<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>ANT programs have a relatively high "dwell time," well above the NSF expectation of 6 months. While the complexity of some proposals, especially those involving Antarctic field work, can explain some of these long times between submission and award, dwell times are also high for programs that don't support as much field work.</p> <p>Recommendation:</p> <ul style="list-style-type: none">· ANT should conduct a study of the causes of these long dwell times and strive to reduce them to the NSF norm, especially for less complex, non-field-based studies.· ANT should prioritize increasing bandwidth at McMurdo to allow POs to continue their review and award responsibilities while staged in Antarctica.	<p>YES</p>
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II. Questions concerning the selection of reviewers.

Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>This was a bit challenging for us to judge; in some cases we used the thoroughness of the reviews or the reviewers' own admission of limited expertise to do so. But our general sense is that yes, the appropriate expertise was reflected in the <i>ad hoc</i> reviews, with a couple exceptions where the number of <i>ad hoc</i> reviews was low. In many cases, the review analysis specified the reasons for reviewer choices, but it seems likely that even if the initial portfolio of invited reviewers included the necessary range of expertise, some variability in response could lead to reviews that did not have the same range. As suggested above, a more modern reviewer tracking system would facilitate reviewer selection and range of expertise.</p> <p>Commendations:</p> <ul style="list-style-type: none"> · Clearly the POs are thoughtful in their selection of reviewers. <p>Recommendation:</p> <ul style="list-style-type: none"> · NSF should find a mechanism for COV to more objectively determine the answer to this question. <p>Data Source: Jackets</p>	<p>DATA NOT AVAILABLE</p>

<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p> <p>Based on PO notes in the jackets, we noted only a few cases where reviews were requested from individuals who were conflicted with the proposers. We understand that the new approach that NSF is taking for PIs to identify COI will help the POs do a better job of avoiding COIs up front (before the requests for review are sent out).</p> <p>Data Source: Jackets</p>	<p>YES</p>
<p>3. Additional comments on reviewer selection:</p> <p>None.</p>	

III. Questions concerning the management of the program under review.

Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

Comments:

ANT programs are well managed with a combination of permanent staff and rotators. The committee noted that the personality of POs sets the tone of each program as well as shaping the broader community. PIs sometimes perceive expectations of a program to change with each new PO. Overall programs benefit both from the insights of new leadership and from the continuity of permanent POs. The larger programs (AOE and AG) have sufficient funding for both a permanent PO and a rotator, which offers the possibility of a balance. More broadly, during the time period covered by this COV, ANT shifted to have proposals submitted without a specific program designation, and this pan-ANT structure provides this same healthy level of balance, supports strong collaboration between POs, helps provide feedback and orientation for rotators, and facilitates evaluation of interdisciplinary activities.

During the COV period, as noted above, ANT also shifted to remove specific deadlines, which has shifted the structure of panels and slightly changed how funding is managed through the course of the fiscal year to ensure a balanced program.

Commendations:

ANT program management is effective and has established a structure that supports multi-disciplinary and innovative proposals with engagement from multiple POs. ANT has managed the elimination of deadlines effectively.

Recommendations:

ANT should continue to maintain a balance between rotators and permanent federal employees.

Other areas of NSF, for example EAR, might consider following the lead of ANT in accepting submissions to a “meta program” or to a section as a whole (rather than having PIs submit to smaller “stove-piped” programs). In the case of ANT, this transition to a section-wide proposal allocation was facilitated by the elimination of proposal

deadlines. POs noted that this approach might also work in programs with deadlines, and might be ill-suited for some programs.

2. Responsiveness of the program to emerging research and education opportunities.

Comments: ANT recently went through a reorganization in how proposals are distributed within the program with incoming proposals available to all POs. This has led to greater collaboration between programs and increased co-funding opportunities. In addition, ANT has increased its ability to rapidly respond to community needs leading to several new opportunities within the program including the Thwaites Glacier Initiative (TGI) and a new two-part strategic investment targeting evolution of biota in Antarctica and decoding their genomes, which the program notes was undersubscribed (from the self-study). Part of the ability for POs to remain on top of community challenges is due to their regular deployment to Antarctica where they can see first-hand the logistical and scientific challenges that their PIs face.

Commendations: The committee views the nimbleness of the ANT program as a huge improvement since community coordination is necessary to access some of the more remote, yet important regions of Antarctica. This type of activity should continue. The committee also sees tremendous value in the reorganization in the distribution of proposals with a more general solicitation allowing PIs to simply put their best ideas into the program; this approach also fosters greater interdisciplinary science in the community. The committee also sees value in PO deployment to the field where they can help to make quick decisions about any logistical issues that arise and keep on top of the challenges of working in the field.

Recommendations: The reorganization of the program should be more favorable for interdisciplinary science and the committee recommends that the program explore ways to support workshops that facilitate different disciplinary groups within ANT to work together. A US institution hosting the SCAR meeting could facilitate this, or co-funding workshops that bring disciplines together (e.g. ice-ocean-nutrient cycling in Antarctica). While we commend the program for its nimbleness to respond to community needs, the TGI initiative was not publicly accessible early enough for a number of scientists to participate in the solicitation. Significant lead time is needed to plan logistics in this region of Antarctica and the international partnership that was required for this solicitation necessitated that partners were secured prior to the release of the solicitation since most partners were already partnered. We recommend providing more lead time for PIs and

broadcasting the solicitation via listservs in addition to providing wider community access to the solicitation framing process as it occurs. Further, the committee noted that 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. Details could be ironed out in an RCN to help advance this area of research. 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. Finally, the committee sees the value of ANT POs deploying to Antarctica to see the logistical and other challenges facing their awardees, but these trips are time consuming (contributing to high dwell times) and the connectivity is significantly limited (in McMurdo and South Pole) such that it is difficult for POs to remain actively working while deployed. We recommend improving connectivity in the main science labs at both bases. This would have multiple benefits beyond enabling PO work to continue, including allowing PIs to continue to work through delays and permitting real-time education and outreach opportunities. Alternatively, POs could deploy every other year.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments: The majority of the information used by the COV to address this point was drawn from the ANT self-study. Therein (p. 48), it is stated that “POs actively encourage emerging research directions by facilitating community interaction through workshops, professional meeting Town Hall meetings, or other forums for discussion (self-study Table 14). Some research communities, such as astronomy and ice core research, have established processes for developing long-term research plans and roadmaps. NSF also develops research priorities following a variety of methods that have led to Foundation-wide efforts such as PREEVENTS and the 10 Big Ideas. In addition, the programs use Rapid Response Research (RAPID) and Early-concept Grants for Exploratory Research (EAGER) funding mechanisms to respond to opportunities that are time-sensitive or exploratory, but potentially transformative.” We consider these to be suitable mechanisms for directing the development of the ANT funding portfolio.

Additional information was gleaned from a presentation collectively delivered by a large number of ANT POs on the first day of our virtual meeting (the slides from which were subsequently made available to the COV to aid in preparing this report).

Commendations: Information in the self-study and PO presentation documents the extraordinary diversity of the array of projects supported by ANT, as well as the typically compelling and societally relevant nature of these many endeavors. Moreover, the information in these documents demonstrates that the program has achieved an appropriate balance of projects across the broad spectrum of disciplines represented in its portfolio. Clearly the planning and prioritization processes that ANT has used to guide the development of its portfolio have been effective.

Recommendations: Again, the COV is impressed with the ANT project portfolio and to a great extent recommends that the program continue to conduct 'business as usual' in this regard. However, the success of our virtual COV meeting (using the platform Zoom) led us to speculate whether future iterations of many of the workshops, Town Hall meetings, etc. described above might also be held via Zoom or a similar virtual means. If so, this could provide myriad benefits, in that it would, for example, eliminate (or at least greatly reduce) potential financial and geographic barriers to participation, thereby facilitating the inclusion of students, postdoctoral fellows and other early-career researchers, and (ideally) underrepresented groups. This, in turn, could raise awareness of ANT and the funding opportunities therein within the scientific community, potentially leading to an even more diverse suite of projects and PIs in the program's portfolio.

**Data Sources: Self-Study in eJacket COV Documents, PO Presentation in 2020
ANT Committee-of-Visitors Folder on NSF External Collaboration Portal**

4. Responsiveness of program to previous COV comments and recommendations.

Comments: There was good responsiveness of the program to the previous COV's comments and recommendations. It was positive that the previous COV's report was revisited by the program every year, and each time updates were given to every recommendation. The COV report will likely also be read by GEO and the Director of OPP, so even recommendations that are above the Section level (of which there were several in the previous COV report) are valuable and can effect change, though not at the same speed.

Commendations: The self-study report was incredibly helpful to the COV. It was clear that the self-study report benefited tremendously from having a science assistant to locate and pull out the data and to construct all the informative tables and figures, which made assessing the program easier. The program plans to update the self-study report after this COV review and sees it as a potentially useful guide to the program for incoming POs.

Recommendations: Future COVs should also have the benefit of a self-study report. Although producing it took a great deal of time and effort this first time, future iterations should be less time intensive.

IV. Questions about Portfolio.

Please answer the following about the portfolio of awards made by the program under review.

<p style="text-align: center;">RESULTING PORTFOLIO OF AWARDS</p>	<p style="text-align: center;">APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</p>
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and subdisciplines of the activity?</p> <p>Comments:</p> <p>The COV lauds the impressive array of sub-disciplines funded within each section, and the degree to which allocation of awards among sub-disciplines shows both some degree of variability across, and growth within, some sub-disciplines across years. When viewed at the section level, there is a clear effort to maintain consistency in award rates through the period of review across sections. However, the COV also noted a recent decline in numbers of awards to AAGS and increase in awards to AES from 2016 through 2019. Despite these trends AAGS maintained funding at a rate above average, while AES was funded at the average rate for the period of review.</p> <p>The COV observed that Polar Ed appears to be characterized by a persistently low number of awards. Indeed, Polar Ed, AAGS, and AIRF all have lower submission rates than average. At the same time, all three of those programs also appear to have higher award rates than average when viewed as the percentage of submissions by each of those sections that are awarded. The highest submission rate occurs in the AOE section, which receives an approximately average award rate. Across the entire funding portfolio for the ANT program, the percentage of all program awards made to each section scales positively with the submission rate for each section, indicating effective award allocation proportionally to submission rate. This speaks to efforts to maintain portfolio balance.</p> <p>Commendations: There's a clear effort by POs to create balance or address imbalances across sections. This is also evident in the tendency toward higher funding rates for proposals in some sections</p>	<p>Appropriate</p>

<p>that tend to have lower submission rates, such as Polar Ed and AAGS.</p> <p>Recommendation: The COV recommends that POs consider whether disparity in award amounts (not rates) across sections may discourage multi-disciplinarity or system-oriented thinking in proposal preparation.</p> <p>Data Source: Summary data and Self Study in eJacket COV Documents</p>	
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments and commendation:</p> <p>The COV felt that award sizes were clearly appropriate for the duration and scope of projects. However, we also note that the AES section tends to comprise the largest number of awards, which may indicate smaller average amounts per award within this section.</p> <p>Recommendation: We encourage consideration of whether there are inherited programmatic preconceptions about what the typical size of an award should be based on prior funding experience. The COV wonders whether there is a programmatic mechanism in place to make accommodations for atypical award sizes in particularly meritorious cases, and if not, whether development of such a mechanism should be encouraged to promote moving the boundaries for what is considered a typical award for a section.</p> <p>Data Source: Summary data and Self Study in eJacket COV Documents</p>	<p>Appropriate</p>

<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments:</p> <p>Based on our Jackets and our expert opinion, we found that the different portfolios discussed had between 30 and 45 % of proposals which were considered Innovative or Transformative, based on the documents analyzed in the Jackets.</p> <p>Still, we found it unclear how to properly estimate whether a proposal was Innovative or Transformative as, by definition, this is one of the main properties that proposals submitted to NSF should have. In this regard, we encourage the program to provide more explicit guidance to address the question concerning innovation by providing explicit definitions or suggesting tools that could help identify this in the future. It is also not clear how much “bias” is introduced by simply looking at the documentation within the Jackets as many proposals or Jacket documents might have included these terms in view of the NSF mandate. We suggest this question to be removed as it might not provide valuable information.</p> <p>Commendations: The committee applauds the effort of the program to promote the innovative and transformative nature of the projects.</p> <p>Recommendations: However, we recommend this question to be removed as it might not provide valuable information.</p> <p>Data Source: Jackets</p>	<p>Data not available</p>
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments: As in the case of “Innovation” we discussed the definition of Interdisciplinary / Multidisciplinary definition. The analysis of the proposals within our Jackets show a large range within each portfolio, from a small percentage of interdisciplinary proposals to roughly 50 % of the portfolio.</p> <p>Commendations:</p>	<p>Appropriate</p>

<p>Recommendations: We encourage the program to continue increasing the interaction with programs outside GEO, such as CISE, Engineering. Filling positions such as the PO in Polar CI could facilitate this.</p> <p>Data Source: Summary data and Self Study in eJacket COV Documents</p>	
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments: The committee found the geographic distribution to be appropriate. They noted that there was a diversity of states represented within each subsample of proposal jackets and that many of the collaborative proposals had a wide geographic scope within projects.</p> <p>EPSCoR-eligible states had, as expected, fewer submissions of competitive proposals. States with low submission rates had high funding rates—if there was one submission from a state, it was often funded. As submission rates have increased, funding rates approached the ~30% typical of non-EPSCoR-eligible states. The committee agreed that this is a reasonable approach to diversifying the state-level geographical distribution of the portfolio but asked whether there was evidence of EPSCoR funding leveraging persistent increases in proposal submissions and success rates. The program staff indicated that EPSCoR co-funding is generally used to support proposals that are meritorious but on the borderline of funding. They said that this co-funding can often support program portfolio balance, such as support of early career investigators or under-represented groups. The program staff was uncertain about the longer-term impacts of EPSCoR co-funding. The committee was curious about retrospective analysis of historic EPSCoR co-funding and grant outcomes to determine the efficacy of this program for increasing research competitiveness in Antarctic research but felt that this was not a high priority given that EPSCoR serves programmatic portfolio balance.</p> <p>Non-EPSCoR-eligible submissions and awards were dominated by CA (25% of awards) and CO (12% of awards), while funding rates</p>	<p>Appropriate</p>

<p>were relatively consistent across states (~30%). States that were substantially under-represented relative to population were TX and FL.</p> <p>Commendations: The committee commended the geographic diversity of the portfolio.</p> <p>Recommendations: The committee noted that predictable, long-term NSF investment in research activity centers is important. However, there need to be clearly identified pathways for increasing research productivity in states or institutions that do not have a strong history of work with the ANT Section. Suggested mechanisms include encouraging and supporting workshops, town halls, and proposal development presentations that are held in states or at institutions that are under-represented in the portfolio.</p> <p>Data Source: Summary data and Self Study in eJacket COV Documents</p>	
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments: The committee was not surprised that public PhD-granting institutions dominated submissions and awards, with an average funding rate of about 28%. Although a smaller proportion of awards, private PhD-granting and MS-granting institutions had similar funding rates to public PhD-granting institutions. By contrast, funding rates for public MS-granting and other institutions fell below 20%. Public MS-granting and other institutions (presumably undergraduate institutions, community colleges, tribal colleges, etc.) often serve groups of people underrepresented in the sciences, so pathways that lead to more, competitive submissions from these institutions could fulfil multiple aspects of portfolio balance. This is applicable, in particular, to HBCUs, which had a somewhat higher funding rate, but very few submissions or awards.</p> <p>Commendations: The Antarctic program has a high percentage of awards that go to Hispanic and minority-serving institutions that are primarily Public PhD universities. The committee commends the staff for this portfolio balance.</p>	<p>Appropriate</p>

<p>Recommendations: The committee suggested two pathways for increasing awards to Public MS, HBCU, and Other institutions: (1) NSF creation and marketing of public-facing documents that highlight funded researchers from these 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 and thus increase opportunity for discovery and future collaboration.</p> <p>Data Source: Summary data and Self Study in eJacket COV Documents</p>	
<p>7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators?</p> <p>NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award.</p> <p>The rate of award to new and early-career investigators appears to be very consistent across programs and similar to the overall funding rate, just below 30%.</p> <p>The COV noted that AAGS and AOAS appear to fund early career PIs at slightly higher rates than other programs, and that AIRF and PolarCI appear to fund early career PIs at lower rates. All four of these programs have lower than average numbers of submissions from early career PIs, so the award percentages may be influenced by small numbers of proposals included in the analysis.</p> <p>The COV believes that AIRF and PolarCI are intended to support larger integrative efforts which are typically led by more senior PIs. The interpretation that large integrative initiatives are typically led by more senior PIs is also consistent with funding totals by career stage data. These show that the most expensive awards made by ANT are</p>	<p>Appropriate</p>

all led by late-career PIs, but that otherwise there are not strong systematic relationships between career stage and the size of awards.

Overall, the group feels that the ANT is appropriately supporting early career investigators, both through the award pathway and through extraordinary mentoring and feedback during the review process. Several COV members pointed out particular efforts by POs to help early career investigators refine their proposals for future success.

COMMENDATIONS:

The COV commends the ongoing practices for supporting early career investigators through awards and through feedback during the review process.

RECOMMENDATIONS:

The COV notes that entry into the ANT scientific community has substantial barriers, especially related to the complex logistics and to the demands of field investigations. The COV recommends that ANT take particular steps to facilitate engagement by new investigators including sponsoring or directly providing workshops (virtual and in-person), webinars, FAQs, and other informal ways of connecting early career scientists to more experienced mentors. The COV also mentioned the role of representation in encouraging both new and underrepresented investigators to propose to ANT, suggesting that public-facing materials should showcase young and nontraditional investigators as much as practical.

<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments:</p> <p>The COV feels that recent trends toward richer and more comprehensive BIs have led to close integration of research and education. Funding decisions often involve co-funding with multiple programs, especially polar education, leading to systematically above-average co-funding by that program.</p> <p>In summary, the COV believes that an appropriate integration of research and education is supported by awards. We note that cultural changes in BIs practices contribute positively to this integration.</p> <p>COMMENDATIONS: The COV commends the flexibility demonstrated by co-funding practices in support of integrated research and education.</p> <p>RECOMMENDATIONS: The COV recommends that ANT personnel take particular care not to use education and outreach proposals to balance ANT-wide award demographics. Members of the COV noted that female and underrepresented PIs appear to be disproportionately awarded in the Polar Education program, but we could not separate this effect from the fact that females were PIs of Polar Education proposals at higher rates than of proposals in other programs. We recommend considering demographic balance both within and across programs in ANT.</p>	<p>Appropriate</p>
<p>9. Does the program portfolio have appropriate participation of underrepresented groups^[3]?</p> <p>Comments: Most of the information in the self-study that relates to URM is presented in the institutional section (self-study Table 17). HSI, MSI and HBCU institutions submit a relatively small number of proposals overall but are successful at about the average rate. Thus, systemic bias is not evident in the treatment of PIs or Proposals.</p> <p>More data are available for women, who remain underrepresented in many of the ANT science programs. For the most part, the success rate of projects led by female PIs is close to average across most ANT programs. CI stands out with a low success rate and AAW stands out with a high success rate for women, but both of these are small</p>	<p>appropriate</p>

proportions of the total proposals. Both AAGS and AOAS have higher than average success rates for women. These are the same programs that have higher than average success rates for early career scientists, so this may signal a demographic shift in the overall population of proposal writing scientists, as more women enter the field.

Self-identified individual URM PIs amount to 13% or fewer of the total submissions and we have no data on success rates broken out by ethnic identity. Thus, our discussion focused on how to improve submission rates from URM/NMI, HSI and HBCU, both at the individual and institutional levels. These incentives have been mentioned in response to Question 7 above. We emphasize the potential benefit of mentoring and apprenticeship opportunities that could be fostered by incentivizing experienced funded PIs/research projects to include URM in their programs by providing supplements to funded programs. Establishing a research cooperation initiative by the funded program might tap into institutions and individuals who had not previously imagined applying to the ANT program, thus increasing the size of the applicant pool and serving a greater diversity of institutions and populations overall. Such apprenticeships would also enable URM to overcome the hurdle of initiation into the challenges of ANT research by working with experienced PIs, thus improving the success rate of their own subsequent proposals.

COMMENDATIONS:

There is no evidence of bias while there is much evidence of conscientious effort on the part of the POs to diversify the science portfolio and increase community involvement.

RECOMMENDATIONS:

Using supplements to funded and experienced projects should be considered as a way to both diversify and enlarge the proposal base.

Data Source: Summary data and Self Study in eJacket COV Documents

<p>10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p>Comments: The portfolio as a whole supports the stated national and agency missions. No glaring omissions or deviations were noted.</p> <p>The National Research Council (2015) report “A Strategic Vision for NSF Investments in Antarctic and Southern Ocean Research” was commissioned to develop community guidance on priorities and strategic steps forward for Antarctic research, based on the status of the USAP. The findings included maintenance of current core programs supporting basic research, and identification of three high level strategic priorities and five foundational elements required to support and facilitate the research recommendations.</p> <p>In considering the question of relevance to national priorities and mission, we consider the high-level strategic priorities:</p> <p>a. Changing Antarctic Ice Sheets Initiative This priority was highlighted in the AG program, both in terms of recent significant outcomes and future directions. In addition to standard grants, it is the topic of a major program that originated as a priority from the research community, the International Thwaites Glacier Initiative. The Thwaites project is currently underway with eight major projects and a large number of collaborating PIs. NSF/ANT supports this consortium in collaboration with BAS and NERC.</p> <p>b. Decoding the Genomic and Transcriptomic Bases of Biological Adaptation and Response Across Antarctic Organisms and Ecosystems</p> <p>This initiative is also perfectly aligned with at least one of the 10 big ideas for future NSF investment, understanding the Rules of Life. The self-study states that there has been a lack of research community response to this initiative despite the release of a DCL specifically designed to solicit proposals. At least one project in the review selection was awarded in response to this initiative, and the rationale for supporting that particular project in the PO analysis was that it specifically applied to this priority. The reviews at both ad hoc and panel level might otherwise not have supported funding this proposal. “Omics” is a very powerful approach to understanding</p>	<p>Appropriate</p>
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everything from evolution to biogeochemistry and paleoclimate and is widely applied in the medical, terrestrial and oceanographic research communities. It therefore appears that even greater efforts at communication are necessary to reach the potential investigators – there is no dearth of expertise and no dearth of compelling questions. This area is one in which ANT funding could be leveraged with other programs in NSF and at DOE to support sequencing projects, and therefore might build collaborations along thematic lines in addition to the geographical focus.

c. A Next-Generation Cosmic Microwave Background Program

This priority was highlighted in the AAGS program in future directions. The ‘Stage-4’ ground-based cosmic microwave background (CMB) experiment, CMB-S4, will consist of dedicated telescopes operating at the South Pole, in Chile on the Atacama plateau, and possibly in some northern hemisphere sites. CMB-S4 crosses boundaries between astronomy and physics and would be a joint endeavor with DOE. The case for CMB-S4 has been evaluated by the community, and this community buy-in and the technological developments that have happened already through extensive past investments by NSF make this a tremendous opportunity to make transformative discoveries about the early universe, including testing inflation, determining the number and masses of neutrinos, constraining possible new light relic particles, providing precise constraints on the nature of dark energy, and testing general relativity on large scales.

A question arose as to whether the larger research community was well enough informed about the strategic priorities of the ANT program. Most of the priorities arise to some degree from proposal pressure and grass roots interest, which is a real positive. There was concern that top down selection of research priorities might be biased in the research direction of those writing the reports, i.e., setting the priorities. We acknowledge that this is a difficult potential COI to avoid but suggest that transparency in the development of priorities (community involvement to the widest degree possible) is the best approach. There was no evidence of such bias in the priorities or the funding across the portfolio, but if such skepticism exists among the COV, it likely permeates the research community as well. The solution is transparency and communication, consistently and frequently.

COMMENDATIONS:

<p>The ANT program as a whole is truly focused on the national priorities and agency mission. The COV perceived that the ANT program works hard to achieve transparency and communication of research priorities and opportunities. The POs work conscientiously to balance the funded portfolio to support the stated research priorities.</p> <p>RECOMMENDATIONS:</p> <p>Continue and enhance efforts to solicit input from the wider research community to develop research priorities and inform the research community of the overarching national priorities in which to frame their research proposals.</p> <p>Data Source: Jackets</p>	
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>None.</p>	

OTHER TOPICS

1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

The COV believes that, given the particular challenges of working in the Antarctic, the NSF should sponsor some combination of workshop and webinar materials to address best practices around sexual harassment and overall safety in field operations. ANT might consider taking a similar approach around other issues where best practices are not widely implemented, such as dealing with inclusion and equity for intersectional and underrepresented researchers or developing innovative BIs with appropriate assessment.

2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

All covered above.

3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

The COV has identified several actions that would improve operations at organizational levels above ANT. We urge the OPP Advisory Committee to consider these broadly, especially those recommendations that recur in more than one COV report. These recommendations include:

- Building in greater flexibility for cross-program and novel research directions by allowing PIs to propose to sections or divisions, rather than solely to programs, as appropriate. This strategy has been successfully implemented by ANT, so ANT staff could provide guidance on effective implementation and best practices. This would allow for glaciology (for example), traditionally lacking a disciplinary home within NSF, to have a mechanism for funding of ideas that do not traditionally fit within either of the polar programs. In addition, this would likely increase the ability for co-funding and interdisciplinary science across the Directorate.
- Implementing a range of review mechanisms, including *ad hoc* reviews, virtual, hybrid, and face-to-face meetings to facilitate participation by researchers who have barriers to participation in traditional review.
- 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.
- The demographic reporting in proposals and award reporting should be modified to reflect modern identities, including allowing researchers to identify non-binary genders and multiracial cultural identification.
- Challenges in handling Conflicts of Interest, especially in smaller scientific communities such as Antarctic researchers, should be assessed for their impact on the review process. Some possible remedies might be provided by revisiting practices for institutional conflicts and by implementing more modern reviewer tracking and selection tools.
- The review process would benefit from the sort of automation modern journals use.

4. Please provide comments on any other issues the COV feels are relevant.

- Logistics hurdle to performing field work in Antarctica is significant for PIs with young families. We recommend training, logistical issues, etc. that could be done from home ahead of travel that would reduce the time spent away in the field.
- Improve connectivity in McMurdo and South Pole so that POs and PIs can work effectively while away from the office.
- There is great coordination with NERC/BAS as evidenced by The International Thwaites Glacier Project -- develop similar formal collaborations, joint solicitations, etc. with other

Antarctic programs (e.g., Chilean, Argentine). These other programs bring resources to the table that are often lacking in USAP, and vice versa.

- Given reduced availability of resources (e.g., aircraft), might ANT/OPP consider revisiting its policies for accessing particular field sites? For instance, it is not currently permissible to traverse sea ice, but this often presents a barrier (the only barrier, in some cases) to accessing sites. Rather than going to the expense of procuring helicopters to fly over sea ice, or searching in vain for Zodiac-accessible leads through the ice, might ANT consider hiring experienced mountaineers to aid researchers in crossing this ice?

5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

We found the self-study and the jacket evaluation template to be extraordinarily helpful, and as such we suggest that they be made available to future COVs. ANT described the self-study as taking three weeks from a blank slate, but would take considerably shorter time if it was a living document maintained yearly. ANT also described the self-study as being helpful as an on-boarding document for new staff, so it has BIs beyond the COV.

The Committee of Visitors is part of a Federal advisory committee. The function of Federal advisory committees is advisory only. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the Advisory Committee, and do not necessarily reflect the views of the National Science Foundation.

SIGNATURE BLOCK:



For the 2020 Antarctic Sciences (ANT) Committee of Visitors
Prof. Lee R. Kump
Chair

[1] This document has three parts: (1) Policy, (2) Procedures, and (3) Roles & Responsibilities.

[2] [NSB-MR-11-22](#)

[3] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.