

**FY 2020 NSF COMMITTEE OF VISITORS (COV)
REVIEW OF THE
ARCTIC SCIENCES SECTION (ARC)**

COV Membership conducting the review included:

COV Chair

- Mike Sfraga from the Woodrow Wilson Center

COV Members

- Doug Bolender from University of Massachusetts Boston
- Frank van Breukelen from University of Nevada, Las Vegas
- Luis Huckstadt from University of California, Santa Cruz
- Mark Kurz from Woods Hole Oceanographic Institute
- Gudrun Magnusdottir from University of California, Irvine
- Patricia Quinn from National Oceanic and Atmospheric Administration (NOAA) and serving as a liaison with the Advisory Committee to the Office of Polar Programs.

FY 2020 ARC COV Framework

Date of COV meeting: June 16-18, 2020

Program/Cluster/Section: Arctic Sciences Section (ARC)

Division: Office of Polar Programs (OPP)

Directorate: Geosciences (GEO)

Number of actions reviewed: 171 projects (In eJacket you will see 259 proposals. The additional proposals are the collaborators proposals submitted together in one project)

Awards: 64 projects

Declinations: 105 projects

Other: 2 (1xReturn Without Review and 1xWithdrawn)

Total number of actions within Program/Cluster/Division during period under review:
654 projects

Awards: 246 projects

Declinations: 400 projects

Other: 8 (Returns without Review or Withdrawn)

Manner in which reviewed actions were selected

An action is defined as either the NSF decision on a proposal to award, decline, or return without review or the Principal Investigator withdrawing their proposal from consideration.

A total of 654 actions occurred between the financial years FY16 to FY19. Approximately 26% of the actions were randomly selected for review by the Committee of Visitors. These selections are proportional to the total number of awards and declines made within each Program. The Programs selected from are Arctic Natural Sciences (ANS), Arctic Observing Network (AON), Arctic Research Support & Logistics (RSL), Arctic System Sciences (ARCSS), Arctic Research and Policy Support, Arctic Social Sciences Program (ASSP) and Polar Cyberinfrastructure.

Although the focus of the Committee of Visitors is centered on reviewing the external Merit Review Process, examples of proposals assessed through an internal-to-NSF Merit Review Process such as RAPIDS and EAGERs are also included for review.

NOTE: So that COV recommendations, insights, and guidance can be easily identified, these items have been set in bold type throughout the report.

NOTE: Members of the COV thank Beverly Walker and Kate Ruck for their invaluable support throughout the COV 2020 review process.

SECTION I

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS

1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? YES/NO

Comments:

In general, review methods are appropriate. Multiple ad hoc reviews with thorough comments are received for proposals. The role of panels is not as clear, however, as the use of panels in the review process appears to have changed during the period relevant to this COV. When panels were routine, it was not clear from the Jackets what criteria were used to decide if a given proposal was discussed by the panel. No site visits were mentioned.

Number of ad hoc reviews varied; most had 3+ but a few had less than 3. **The COV found that panels provided useful synthetic discussion of a collection of proposals.** We recognize that NSF does not require ad hoc and panel reviews. In our review, we found panels played a critical role in highlighting positive and negative issues in the ad hoc reviews. **The COV strongly recommends that panels be implemented whenever possible.**

Primary Data Source: Jackets

2. Are both merit review criteria addressed

- a) In individual reviews? YES
- b) In panel summaries? YES
- c) In Program Officer review analyses? YES

Comments:

The intellectual merit criterion was thoroughly addressed by reviewers, panels, and Program Officers with nuances of the pros and the cons of the proposed work generally described in great detail. Assessments of the broader impacts criterion were more rote, especially in cases where impacts involved training of students. Activities that included interactions with local communities were deemed positive. Often reviewers, panelists, and/or Program Officers found it difficult to quantify the impacts of some activities (e.g., YouTube videos).

The COV believes a more clear articulation of broader impact expectations for each program should be made to the research community. Consultation within a panel structure could provide guidance for broader impact expectations.

Primary Data Source: Jackets

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? YES

Comments:

With almost no exceptions individual reviewers provided thorough and substantive comments. The ability of the reviewers to provide comments with a high level of insight indicates their expertise was well aligned with the subject of the proposal and that program officers selected appropriate reviewers.

Primary Data Source: Jackets

4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? YES

Comments:

In general, panel summaries provided the rationale behind the panel's assessment. In at least one case, the panel declined to provide feedback because they believed the ad hoc reviews were sufficient. In some instances, panels did not discuss all proposals. The criteria for inclusion in panel review and discussions were not always clear.

Primary Data Source: Jackets

5. Does the documentation in the jacket provide the rationale for the award/decline decision? YES

Comments:

For most decisions, the documentation is thorough, thoughtful, and clearly supports the decisions that were made. As with most processes, there are some examples that are better developed and others that are less developed. Very successful approaches in the Review Analyses are those that provide context to the reviewers, **e.g. explaining the credentials of each reviewer may provide insight into priorities and rationales. The previous COV encouraged all ARC POs to adopt this format and we encourage even more widespread adoption. ARC leadership should consider regularizing a review analysis template form with input by the POs that would encourage a more systematic inclusion of review analysis materials. Furthermore, a statement about research priorities of the panel and some background into the number of proposals, number funded, etc., was exceptionally helpful for later analyses. The Panel's program rating should be included in any template. We recognize that review analyses may require a certain degree of flexibility that may warrant deviation from any strict template format.**

Primary Data Source: Jackets

6. Does the documentation to the PI provide the rationale for the award/decline decision? YES

Comments:

For the majority of decisions, an applicant was provided clear information as to the strengths, weaknesses, and any concerns for a given grant proposal. Similar to the review analyses provided by the POs, the panel summaries vary in quality as to how informative they may be to the grant applicant. **A template form for panel review could reduce this variation and provide more systematic inclusion of review analysis materials. For instance, a requirement of inclusion of both strengths and weaknesses in intellectual merit and broader impacts would facilitate decision support by the PO and provide the PI important feedback.** In relatively few cases, panel summaries were not provided or the proposal was not discussed. Very rarely was only a panel summary provided without individual reviews. This approach raises concerns about how effective the communication of a diversity of criticisms might have been to the PI. **The COV also 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.** Furthermore, early career investigators are particularly benefited by the inclusion of a panel discussion in commentary. While POs are able to relay their thoughts on the process, the COV feels that omission of panels places more emphasis on the PO's assessment without the input of the affected community.

The 2013 and 2016 COVs suggested release of redacted Review Analyses to the applicant. This COV disagrees with those earlier COVs as to sending this information per se as the material requires additional context to be of great use. However, the COV encourages POs to

send PIs any additional information beyond the Panel Summaries and individual reviews that could shed light on the decision making process. For instance, POs should be encouraged to share priorities on desired research scope for that particular panel and what Broader Impacts might be considered appropriate for the particular research community.

Primary Data Source: Jackets

7. Additional comments on the quality and effectiveness of the program's use of merit review process:

The COV found clear evidence that the POs in ARC are responsible, caring, and enthusiastic in their role supporting research, and commends these individuals for their efforts to ensure the integrity of the robust peer review system.

Primary Data Source: Jackets

SECTION 5 SELECTION OF REVIEWERS

1. Did the program make use of reviewers having appropriate expertise and/or qualifications? YES

Comments:

Throughout the review process, it was evident to this COV that the selection by the POs of proposal reviewers is based on their appropriate expertise and qualifications. The *ad hoc* reviewers, in particular, were found to be experts in the particular fields and performed their duties diligently and in a professional manner, maintaining a cordial tone and showing no animosity against individual proposals or investigators. Their comments and suggestions were generally constructive. For a few proposals, ad-hoc reviewers, or their field of expertise were not disclosed. **We encourage ARC to adopt a common template when presenting this information to avoid mismatches among POs and/or programs in ARC.**

Suggestion: Include a table on the first page with ad-hoc reviewers Name, Institution, Area of Expertise, and Score.

Primary Data Source: Jackets

2. Did the program recognize and resolve conflicts of interest when appropriate? YES

Comments:

It is evident that the ARC programs make a conscious effort in identifying potential conflicts of interest and take the appropriate measure when found. Likewise, when a COI was mentioned by a reviewer but did not match the NSF criteria to be classified as such, the POs clearly stated so and considered the review

Primary Data Source: Jackets

3. Additional comments on reviewer selection:

After careful consideration, it is the opinion of this COV that the ARC program does select ad hoc and panel reviewers of appropriate expertise and qualification. **This COV agrees with COV 2016 and encourages NSF to continue efforts to improve the participation of under-represented groups as reviewers. We 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).** We suggest that the program can crosscheck with databases such as APECS (Association of Polar Early Career Scientists), and other resources that might have information on ECR in polar sciences. Likewise, reaching out to small and medium-size institutions, where there are a larger proportion of minorities, can help close the gap. This suggestion can be particularly effective at increasing the representation of indigenous researchers that might remain foreign to the proposal reviewing process.

SECTION III MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

Comments:

The COV commends the ARC program for maintaining a talented pool of qualified Program Officers and staff, during a challenging period of departures and retirements by experienced personnel. At this writing most of the Program Officers are relatively new to ARC, including a combination of Permanent NSF staff, Temporary Federal workers, and IPA/Rotators. The COV is impressed with the dedication, diverse skills and energy of the group. **The COV recommends that ARC continue to strive for a balance between permanent staff and qualified rotators and build on the strengths of the group. We also recommend that ARC consider practices that ensure continuity in training and program practices.**

The removal of submission deadlines for all ARC Programs has dramatically changed the workflow since the previous COV. This change was instituted in FY 2017 and the number of submitted proposals has decreased dramatically. The submission timing has also changed, with a steady supply over the course of the year, in contrast to deadline-driven submissions. This has resulted in changes to the workflow for all the Program Officers. Some of the Programs have adjusted to this change by decreasing the number of panels, and combining with other OPP subject areas. Other programs have done away with the use of panels, and are relying entirely upon ad hoc/mail reviews for external opinions. The rationale for eliminating panels is that Program Officers can process the proposals as they arrive, and thus minimizes long dwell times. The mail reviews provide specialized expert evaluation of proposals. As mentioned above, the COV considers the panel to be an important aspect of the review process, particularly in providing an overview of the program portfolios, and facilitating community input to program priorities. **The COV recommends that ARC re-institute the use of panels wherever feasible.** This may involve smaller groups of proposals and/or the combination of subject areas in new and innovative ways. For example, it may be feasible to combine AON and ARCSS into one panel twice a year. It may also be possible to combine with other related disciplines in GEO (ANT, EAR, or AGS), or other NSF Directorates (in the case of ASSP). **The COV encourages ARC to evaluate the impact of no-deadlines on submission rates, proposal quality, and the review process.** The COV was perplexed by the decrease in proposal numbers with the elimination of deadlines, and wondered if there is an understanding of the underlying causes, i.e. via studies in other NSF Divisions.

The COV commends the ARC program for organizing a Portfolio Review in 2018.

(https://www.nsf.gov/geo/opp/opp_advisory/meeting_docs/october2019/Arctic_Portfolio_Review_FIN_AL.PDF). **The portfolio review committee recommended that ARC science programs reorganize into three sections: Natural Sciences and Systems (NSS), Social Sciences and Systems (SSS), Coupled Human-Natural Systems (CHNS).** The COV recommends that ARC consider this recommendation in light of decreasing proposal submissions. Removing the number of distinct programs might improve efficiency and reduce confusion about program boundaries, thus encouraging innovative disciplinary and interdisciplinary research. It might also allow a more direct and timely evaluation of the trade-offs between funding small and large research projects.

Primary Data Source: Program Presentation

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

Comments:

The ARC program is responsive to new research and education opportunities. It is well positioned by virtue of NSF Staff participation in U.S. and International Arctic research, policy, and planning activities such as the U.S. Interagency Arctic Research Policy Committee (IARPC). **The COV recommends that ARC encourage participation in national and international Arctic research coordination activities.**

ARC has extensive collaborations with other programs within GEO and other NSF Directorates. ARC is involved in the important new program Navigating the New Arctic (NNA), which is hosted in the Geosciences Directorate, with NSF-wide participation. The goal of NNA is to support "the research and dissemination of new knowledge needed to inform the economy, security, and resilience of the Nation, the larger Arctic region, and the globe with respect to Arctic change." (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505594) This program was founded in 2016 as one of the 10 "Big Ideas" within NSF, in recognition of the importance of the Arctic for science and society. It emphasizes projects that combine Arctic interdisciplinary research with human impacts. **The COV applauds ARC involvement in NNA and supports coordination between NNA and ARC programs, particularly in sustaining diverse research portfolios.**

The COV applauds the involvement of a dedicated Program Officer in ARC, who acts as liaison to the Geoscience Directorate with respect to education matters. **The COV recommends maintaining a commitment to education as a key aspect of the portfolio.**

The COV commends ARC involvement in the *Multidisciplinary drifting Observatory for the Study of Arctic Climate* (MOSAIC) which is the first modern expedition to spend an entire year in the Arctic on the RV PolarStern, led by Germany. This large international initiative includes significant participation from a number of U.S. scientists supported by ARC (including AON, ARCSS, and ANS). This program is ongoing and the COV looks forward to the results of this important and timely endeavor.

Primary Data Source: Program Presentation

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

Comments:

Internal program planning and prioritization:

The COV heard from ARC Program Officers that they are focused on this important aspect and meet regularly as a group to discuss program planning and prioritization. **The COV recommends that this internal evaluation be continued and expanded.**

External program planning and prioritization:

The COV commends ARC for efforts at program planning and prioritization. An important example is the Arctic Horizons project which involved a series of workshops funded by ASSP, culminating in a final report outlining Social Science research priorities (<http://arctichorizons.org/final-report>). **The COV recommends that Program Officers continue to facilitate planning and community discussion workshops and town hall meetings (e.g. at AGU), and that ARC compile a running list of these activities.**

The COV notes that Arctic research requires coordination between many federal and international agencies. This includes considerable effort by ARC. One important example is the U.S. Interagency Arctic Research Policy Committee (IARPC), which is chaired by NSF (with day-to-day leadership by OSTP). We note that IARPC is presently preparing an Arctic Research Plan for 2022-2026, with participation of several NSF ARC personnel. Another example is the International Arctic Science Committee (IASC). **The COV recommends that ARC maintain and enhance its**

participation (where applicable and practical) in national and international Arctic research coordination activities, and that it also encourages community participation in these efforts.

Primary Data Source: Program Presentation

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

NOTE: This COV's comments are in response to COV 2016.

Comments:

Extensive Dwell Time, Section III.1 page 4: The COV was advised by AON, ASSP, ANS, and ARCSS that the objective for proposal response ("dwell times") was to have 75% of the decisions returned to the proposers within six months of submission. Of the ~160 jackets assigned to the COV, dwell times for ~80% (including those in the EAGER and RAPID categories) did not achieve this objective.

2020 COV: Dwell times remain high. Based on the annual responses to the 2016 COV report it was clear that ARC made efforts to decrease dwell times. Several factors complicated these efforts. The elimination of proposal deadlines in 2017 resulted in a dramatic change in proposal submission, both in number and in timing. Other factors included the 2019 government shut down and budget uncertainties related to operation of the U.S. Government on Continuing Resolutions. Recognizing that ARC Program Officers are working on this issue, **the COV encourages all possible efforts to decrease dwell times and to keep Investigators informed of pending decisions.**

ASSP and AON Program Mortgages, Section III.1 page 4: Over the three-year time frame covered by this COV, two programs developed extensive out-year commitments that greatly hindered their ability to commit substantial funds to the annual grant competition. It is the opinion of the COV that the Section should adopt a more conservative approach that limits out-year commitments, which safeguards resources to support new research proposals and provides a buffer against unanticipated programmatic cuts.

2020 COV: **Based on the 2020 discussions, it appears that this has been addressed, and program mortgages are no longer an issue.**

AON Program Management, Section III.4 page 10; Section IV.2 page 12: Some form of a high-level, external, strategic planning initiative needs to be mounted to assist the AON PO to identify the rationale and the structure of a functional AON network. This planning needs to include strategies to "hand off" mature data streams to willing partners and to introduce new and better technologies into the observing network in such a way that the value of existing data is not compromised and new data can be collected more efficiently and at lesser cost. The COV has the following overarching recommendations for strengthening AON and providing a smoother evolution to a fully functioning network. These include an increase in funding for AON and development of a strategy for targeting the type of datasets collected, including a mechanism for long term funding, where LTER, CZO, and LTREB are reasonable models.

2020 COV: It appears that the lack of a strategic plan for AON remains an issue; **this COV encourages continued specific planning for AON.** Past AON challenges were partly related to PO turnover; the COV applauds ARC for filling this position on permanent basis and believes this action will help to advance AON's mission. There is an LTER in the present portfolio, so the program has responded to these comments. **The COV recommends that ARC form an external (or internal to OPP) advisory committee to evaluate the AON program balance and proposal submission trends, the viability of AON as a distinct program, and to aid the PO in developing a strategic plan.**

ARC Staffing and Workforce Development, Section III.1 page 5: To guard against unexpected staff shortages, and to develop the workforce of program officers for NSF's future, the COV suggests that the section consider adding more visiting program staff (IPAs or Temporary Feds), to (a) keep perspectives fresh, (b) assist with workload and unanticipated staff changes (and reduce dwell times), and (c) contribute to the pool of academic scientists with sufficient administrative experience and acculturation to replace NSF staff that are likely to retire over the next 5-10 years.

2020 COV: ARC has experienced rapid turnover in Program Officers in the last four years, as predicted in 2016. **ARC has successfully dealt with the issues by hiring new permanent and temporary staff.**

Panel Summary Improvement, Section I.4 page 2: The COV encourages the program managers to be sure that the panel summary is a summary of the deliberations of the panel, rather than a summary of the ad hoc reviews.

2020 COV: This remains as an issue but is now relatively minor because most of the ARC programs have eliminated the regular use of panels. **As indicated above, the COV encourages reinstating the use of panels.**

Panel Member Justification Documentation, Section II.1 page 3: It was more difficult in general to assess the qualifications of the panelists, and more specifically, the qualifications of the panelists who contributed to the panel summary. The COV suggests that the Program include a similar description for the primary panelist assigned to a proposal, along with the ad hoc reviewers in the Review Analysis documentation.

2020 COV: As mentioned above in the comments about Review Analyses, **this remains as a good recommendation.**

Staying Abreast of Emerging Research, Section III.2 page 6: The COV also noted that Arctic Sciences should take steps to "keep up" with rapid technological changes, to ensure that programs have the opportunity to use cutting edge technology to support the best science possible... To address the challenges introduced by the current rapid expansion of technological innovation, the COV again recommends that NSF ARC recruit young scientists into rotator positions.

2020 COV: ARC has now addressed this recommendation with new Program Officer staffing.

In defense of top-down input/cultivation of a program, Section III.3 page 7: Given the decision to operate the section in response to distribution of projects submitted (i.e., from the ground up), the COV presumes that the distribution of funded projects differs among disciplines but reflects the distribution of submitted projects by discipline. We suggest that the ANS Section should also include a proactive approach, engaging in dialog with the research community to identify compelling research directions.

2020 COV: ANS has addressed this recommendation with community engagement including the sponsorship of workshops.

Connecting Funding Decisions to the Larger, National Initiatives, Section IV.10 page 15: However, as noted earlier in this report, the COV encourages the Programs to advocate for input from the research community that then informs strategies like the IARPC 5-year plan, which then guides future research. In reviewing the program solicitations, some Programs could be more proactive in making these connections explicit and are encouraged to do so. POs did not

generally comment on these connections or the role of other reports such as the National Academy of Sciences Arctic in the Anthropocene report and the SEARCH research priorities. The COV suggests such connections be described in PO reports to future COVs.

2020 COV: The 2020 ARC presentations mentioned the present IARPC 5-year plan, and that the next plan (2022-2027) is in preparation. Since the logistics and research planning landscapes are presently in a state of flux, **the COV agrees with this recommendation for the future.**

ANS/ARCSS Program Identities, Section III.4 page 9: It remains difficult to articulate to the research community the nuanced differences between the ANS and ARCSS programs. Although clear in the minds of the ARC Staff, confusion remains in the research community.

2020 COV: **This appears to remain as an issue. The 2018 Portfolio Review recommended combining the two programs and the COV encourages clarification and exploration of the distinct role of ARCSS.**

Broader Impacts, Section I.2 page 1: The variability and ambiguity are an intrinsic part of the NSF's review process and the COV only wishes to make an observation. There is no judgment or criticism implied. That said, if there is concern about the role that broader impacts play in the award process, it might be worth tracking the number of requests that include dedicated funds for broader impacts. This information could be included in the review analyses and would highlight the reality that broadening impact always takes time, and usually takes money.

2020 COV: Assessment of Broader Impacts in proposals remains an issue. As discussed above, **the COV 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.**

Early career reviewers/Panelists, Section II.3 page 3: The COV encourages the Program to continue to include early-career investigators and underrepresented groups as part of the review process. The COV appreciates that it is difficult to quantitatively assess the participation of these groups, owing to the self-reported nature of the data, and the COV did not identify an obvious way to do this.

2020 COV: The COV concurs.

Primary Data Source: Program Presentation

SECTION IV RESULTING PORTFOLIO OF AWARDS

1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity? YES

Comments:

The program portfolio has an impressive range of disciplines and sub-disciplines, including Oceanography, Atmospheric Science, Terrestrial Science, Glaciology, Geology, Ecology, and the Social Sciences. The 2016 COV identified a limited range of disciplines funded in AON, with approximately 1/2 of the funded projects in Oceanography, and a lack of a clear strategy for proposal selection across Arctic disciplines. The 2016-2019 AON awards include an expanded portfolio across atmospheric, marine, freshwater, and terrestrial systems, although the program continues to further develop and advance its strategic role within ARC, as well as a coordinated and complementary strategy.

Primary Data Source: Portfolio Data

2. Are awards appropriate in size and duration for the scope of the projects? YES

Comments:

The size and duration of awards was largely appropriate. Each program showed a smooth distribution of award levels with a small number of larger awards and the majority of awards falling below the mean award amount. The most common project duration was the maximum allowed by the program with the exception of ASSP (36 months for ARCSS, ANS, and ASSP; 60 months for AON). ASSP project durations were split between short 12 month and longer 36-month projects. The frequency of maximum duration awards suggests that submitters either attempt to maximize research/funding per submission or constrain the scope and duration of works to conform to NSF project limitations.

With the exception of AON, reductions to requested funds were largely limited to overlaps with extant funding. However, the 2016 COV identified a consistent reduction in funds to AON awards. The 2016 COV considered this evidence of underfunding. In the 2016-2019 period, AON has still been forced to reduce awards even as submission rates have declined and award rates have increased.

The 2019 Arctic Portfolio review identified a mismatch between award durations and graduate student support and training:

“there is a growing disquiet among investigators regarding the impact of proposal success rates on their decision processes for taking on graduate students. Because funding is less reliable, graduate students often are not admitted to a degree program until after a project is funded. Earning a Ph.D. generally takes considerably longer than the average funded project duration of three years, and graduate students typically spend their first two years focused on coursework. The delay in admission until support is secured combined with the initial focus of coursework has the unintended consequence of graduate student focus being out of phase with funded project activities. The research experience of graduate students is diminished, and faculty can struggle to maintain continuous support for students. The committee felt that this problem has a direct impact on the goal of increasing diversity and inclusion in Arctic sciences.” (p.7)

The COV recognizes the inherent problems of coordinating graduate student support and research with grant-award durations. The COV also notes that ASSP is the only program that awards DDRIGs; whereas other projects generally seek funding to support doctoral or post-doctoral

positions. **The COV recommends ARC consider an expansion of DDRIG support across all programs (Also see IV: Questions about Portfolio – Resulting Portfolio of Awards).**

Primary Data Source: Portfolio Data

3. Does the program portfolio include awards for projects that are innovative or potentially transformative? YES (QUALIFIED)

Comments:

Many ARC awarded projects are engaged in potentially transformative research (PTR). However, as noted by the 2016 COV, the assessment of innovative or potentially transformative projects is highly subjective. Ad hoc reviewers frequently point to innovative or transformative aspects of proposals but often with limited explanation of how this designation is determined. Panel reviewers and review analyses rarely provide any comparative basis to rate the relative transformative potential of projects.

PTR appears to be an unevenly assessed criteria in the review process. While PTR is often identified and positively assessed by reviewers, the lack of PTR is usually only indicated in omission. This raises the question of how reviewers and POs assess PTR and what aspects of a research project or outcome are considered innovative or transformative within the review process. In general, reviewers point to innovation in methods and potential transformation in terms of research outcomes (especially the production of new datasets for the broader research community). New areas of research or perspectives were less frequently described as innovative or potentially transformative, although this is one of the main characteristics of PTR as defined by NSF (https://www.nsf.gov/about/transformative_research/definition.jsp)

The COV recognizes the steady march of foundational research often results in innovation and transformation and that truly transformative or paradigm shifting research is highly risky, rare, and frequently unpredictable. **The COV recommends a systematic assessment of PTR in review, clearer justification for a PTR assessment, and comparative assessment of PTR at the panel and PO levels. For example, having a panel vote for designation of PTR projects would more clearly identify these projects.**

EAGER and RAPID awards make up a small percentage of the portfolios across all programs. EAGER and RAPID awards are often requested to pioneer and validate innovative or risky research projects. The COV also recognizes the role of EAGER and RAPID mechanisms promoting early career investigators and investigator diversity.

The ANS presentation argued for transformative research as an emergent phenomenon coming from an aggregate of multiple, independent projects. **The COV supports the idea that transformative outcomes are often the product of synergy among multiple, independent projects and that PTR may be managed in the proposal solicitation, review process, and the strategic management of Program portfolios.**

The 2016 COV considered the potential value of developing a metric to assess the transformative quality of funded research based on the quantity or frequency of citations of published material resulting from research while simultaneously recognizing the limitations of a quantified approach to assessing PTR. **This COV does not agree that it is possible to develop a single metric to quantify the PTR of a project.**

Primary Data Source: Portfolio Data & Jackets

4. Does the program portfolio include inter- and multi-disciplinary projects? YES

Comments:

Arctic research is often multidisciplinary in nature and the program portfolios include a large proportion of collaborative and multi-disciplinary projects.

Primary Data Source: Jackets

5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? YES

Comments:

Many states are represented yet, not surprisingly, for three of the four programs the predominant number of PIs are from Alaska; ANS was the exception with the second largest number of awards. ANS also supports the largest number of overall awards from the greatest number of states.

Primary Data Source: Portfolio Data

6. Does the program portfolio have an appropriate balance of awards to different types of institutions? YES

Comments:

The distribution of awards between different types of institutions is remarkably similar for all programs. The majority of awards were made to PhD granting institutions, with fewer awards to other educational institutions. Private research entities were granted the third highest number of awards.

Primary Data Source: Portfolio Data

7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? YES

Comments:

Success rates for early-career investigators are about the same as for other investigators. There are fewer new investigators than early-career investigators making it challenging to draw any meaningful conclusions from the overall numbers. Early career investigators submitted more - and were awarded more proposals in the ASSP than the other ARC programs.

Primary Data Source: Portfolio Data

8. Does the program portfolio include projects that integrate research and education? YES

Comments:

The portfolio data include several examples in each of the four programs of awards that integrate research and education. Additionally, the ANS supported CAREER proposals that require integration of education and research components. All programs except AON provided travel support for early career investigators to attend meetings.

Primary Data Source: Jackets & Portfolio Data

9. Does the program portfolio have appropriate participation of underrepresented groups¹? YES

Comments:

In terms of gender, the ASSP program had the highest proportion of submissions from woman, as well as awards granted compared to the other programs. Overall, a minority of awards went to female PIs and awards to underrepresented ethnic and racial minorities are even more limited. **The COV commends the NSF/ARC for efforts to expand representation in the overall proposal pool and encourages continued diligence in this effort.**

Primary Data Source: Portfolio Data

10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? YES.

Comments:

The ARC portfolio presentations, reports, national priority lists, and agency goals and vision statements guided the COV. The COV notes the ARC's involvement with the Interagency Arctic Research Policy Committee. Importantly for an Arctic context, the Program also coordinates through international processes like the International Arctic Science Committee, the Arctic Council and others. Additional efforts include recent Belmont proposal calls and participation with the Arctic Science Ministerial. Arctic Research and Support Logistics solicited community led reports in 2003 and 2013. **The COV encourages more frequent solicitations.** Much like other Programs within NSF, ARC is guided by the research community through standing panels as opposed to imposing research directives. **While this approach emphasizes the notion that the best research is done by dedicated specialists, it may be refined through continued processes that encourage increased collaboration such as co-funding from both NSF and non-NSF sources.**

Primary Data Source: Jackets & Portfolio Data

11. Additional comments on the quality of the projects or the balance of the portfolio:

The COV found no issues with the quality of the projects and, in general believe there is a good balance in the portfolio.

Primary Data Source: Program Overview Presentation

¹ 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.

SECTION V OTHER TOPICS

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

I. Select Strategic Planning:

A) **The COV recommends** ARC form an advisory committee to evaluate the AON program balance and proposal submission trends, etc., in an effort to support and aid the PO in developing a strategic plan that meet ARC's vision for the program and reflect the PO's desires to support the Arctic community's growing need for AON-related initiatives.

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.

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

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

I. Discussion with the POs of the ARC revealed several areas of potential reform that the **COV supports**.

- A) Development of a mechanism that supports emerging technologies is warranted. New instrumentation and approaches are oftentimes risky and as a result, meets resistance by reviewers.
- B) Managing conflicts of interest among reviewers and panelists in small fields is a barrier for effective institution of panels. We support relaxing the strict adherence to COI standards in light of increased collaboration that characterizes modern science. We suggest instead adopting applicable mechanisms to appropriately adhere to the intent of COI requirements while allowing for flexibility in the case of modest collaborations e.g. when authors are part of larger consortiums.
- C) The hiring of a Science Assistant would be of benefit and allow POs to target development of other programmatic needs.
- D) There is a need for "seed type grants" to generate preliminary data for later submission. Currently, this need is filled by supplement to existing award, EAGER, and RAPID mechanisms. Unfortunately, these mechanisms require significant administrative time and development of a small seed grant mechanism that is more efficient may be explored.

II. The Future of Arctic Research: Issues and Realities for Consideration.

The COV offers **for consideration** the following list of issues, drivers, questions, and themes that we believe will, to varying degrees impact ARC in both the long and short-term.

- A) Is ARC well positioned to manage and deliver its mission during a prolonged COVID-19 scenario?
- B) Is ARC well positioned to address the many diverse, yet interconnected research needs and demands that the new and dynamic Arctic requires?
- C) Is ARC well positioned to address the pending needs of the research community to address and execute relevant components of the multi-national *Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean*?
- D) Is ARC well positioned to address applicable aspects and articles of the 2017 Arctic Council binding *Agreement on Enhancing International Arctic Scientific Cooperation*?

- E) Will ARC short and long-term research needs and requirements be met by the nation's Polar Security Cutter fleet and ice strengthened Research Vessel capabilities?
- F) To what degree should/can ARC influence design and functionality of the future Polar Security Cutter fleet so the research community's equities are considered and addressed?
- G) To what degree, if any, will activities and initiatives of the Arctic Science Ministerial impact, inform, and influence future ARC programs, administration, and organization?

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


A) Provide eJackets and all related documentation to COV members at least one month prior to the Committee's official deliberations to allow the group sufficient time for evaluation.

B) Consider increasing by one COV membership to decrease the number of eJackets/projects each member is required to review. This will also help to address unforeseen changes in the overall number of COV members as a result of COI issues that may emerge during the process, members no longer able to serve as a result of external factors unrelated to the process, etc.

C) This COV was convened during the coronavirus pandemic when it was necessary to meet remotely. The COV recommends that future deliberations include in-person meetings with NSF personnel whenever possible.

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:



Arctic Sciences Section 2020 Committee of Visitors
Mike Sfraga
Chair