FY2007 Report from the Office of Polar Programs, Antarctic Sciences Section, Committee of Visitors

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Introduction

Guidance to an NSF Committee of Visitors (COV) specifies the provision of "a balanced assessment of ….. performance in two primary areas: (1) the integrity and efficiency of the *processes* related to proposal review, and (2) the quality of the *results* of investments in the form of outputs that appear over time. The COV also explores the relationships between award decisions and program/NSF-wide goals in order to determine the likelihood that the portfolio will lead to the desired results in the future." It is important to recognize that "reports generated by COVs are used in assessing agency progress in order to meet government-wide performance reporting requirements, and are made available to the public (*Committee of Visitors Reviews, NSF Manual 1, Section VII*)."

COVs tasked with reviews of NSF Divisions, Directorates, and Offices in 2007 are asked to respond to a set of Core Questions organized within the following major categories:

A.1. Quality and Effectiveness of Merit Review Procedures
A.2. Implementation of NSF Merit Review Criteria
A.3. Selection of Reviewers
A.4. Resulting Portfolio of Awards
A.5. Management of Program under Review

B.1 NSF Outcome Goal for People
B.2 NSF Outcome Goal for Ideas
B.4 NSF Outcome Goal for Organizational Excellence

C.1 – C.6 Other issues that the COV feels are relevant to the review

NSF Office of Polar Programs FY 2007 COV Review of the Antarctic Science Section

This report presents the results of the FY 2007 COV review of the Antarctic Science Section of the Office of Polar Programs for the period FY2004-2006, and it follows the template of major topic areas and Core Questions set forth in the NSF COV directive cited above. It is noted that these sections were last reviewed in September of 2003 (spanning the period FY 2000-2002).

In summary, the COV finds the Office of Polar Programs Antarctic Science Section to be well managed and that the Program Officers function in a highly ethical manner, ensuring that the merit review procedures are of high quality and effective; the NSF merit review criteria are addressed; and reviewers are plentiful and are respected members of their scientific community. The resulting portfolios contain scientifically high quality

proposals and awards that meet the mission of the Office of Polar Programs and of NSF. The investments in Antarctic research are sound, highly productive, and at the cutting edge of research in the sciences. This report provides a critical review of the Antarctic Section as well as some NSF agency-wide processes. It also provides recommendations that hopefully will improve an already highly respected, research-focused enterprise.

The FY 2007 OPP Committee of Visitors (COV)

Dr. Karl Erb, Director of the Office of Polar Programs, appointed a Committee of Visitors (COV) comprising: Margaret N. Rees (University of Nevada, Las Vegas), Sarah Church (Stanford University), David Smith (Texas A&M University), Tony Worby (Australian Antarctic Division), Doug Wiens (Washington University), Patricia Yager (University of Georgia), Mark Engebretson (Augsburg College), and Ken Jezek (Ohio State University). The committee was chaired by Margaret N. Rees, with James T. Hollibaugh representing the Office of Polar Programs Office Advisory Committee (OAC). The Committee of Visitors (COV) is an *ad hoc* subcommittee of the OAC. The expertise among the FY 2007 COV group spanned most specialty areas in the OPP Antarctic science programs.

The Agenda and Work Plan of the FY 2007 Committee of Visitors

The FY 2007 Committee of Visitors (COV) met at the National Science Foundation on November 6 &7, 2006.

The meeting began with a welcome and introduction by Dr. Karl Erb, Director of the Office of Polar Programs. Dr. Michael Van Woert presented the charge to the FY 2007 COV and clarified its duties within the framework of NSF's Core Question template and briefed the committee on conflict-of-interest issues. Dr. Thomas Wagner provided a comprehensive overview of the review process.

To launch the task and assist the committee, the meeting proceeded with an overview presentations. Dr. Scott Borg, Antarctic Science Section Head, presented an overview of the Antarctic Section, a response to the previous FY2003 COV report, the Antarctic Biology Program on behalf of Dr. Roberta Marinelli, and the Antarctic Aeronomy and Astrophysics Program because the Program Officer position was vacant. He was followed by Dr. Bernhard Lettau summarizing the Ocean Climate Systems Program, and Dr. Thomas Wagner summarizing the Antarctic Geology & Geophysics Program. Because of the extended presentations and the lateness of the day, Dr. Julie Palais kindly provided only a printed copy of her presentation on the Glaciology Program and was available for discussions as needed.

During the two-day meeting, the COV considered data from these presentations and the printed copies along with a range of other documentation as it addressed NSF Core Questions and developed summary comments and recommendations. OPP administrators, program officers, and staff were always helpful and available as needed

throughout the process. Margaret Rees drafted the final report and incorporated comments from the committee, communicating via email.

Sources of Information and Data for the Period FY 2006

1. Program officer briefings and questioning.

2. Proposal jackets (proposal, mail reviews, panel reviews, program manager statements, correspondence, award letters, annual reports, etc).

3. Office of Polar Programs and NSF Electronic Information System (EIS) spread sheet data.
   a. Award size and duration
   b. Average dwell time
   c. Co-Funding Awards from Contributing Organizations
   d. Co-Funding Contributed to Recipient Organizations
   e. Detail Co-Funding from Contributing Organizations
   f. Detail Co-Funding Contributed to Recipient Organizations
   g. Detail Proposal List
   h. Funding Rate
   i. Obligation by Institution Type
   j. PI Transfer Action
   k. Proposal by Institution Type
   l. Proposal by State
   m. Proposal Panel Information
   n. Reviewer by Disability, Gender, Institute, Minority, State, Statistics and Data
   o. Summary of Proposal Action by Type of Proposal

Antarctic Sciences Government Performance and Results Act (GPRA) FY04-FY06
FY2003 COV Office of Polar Programs Response
FY2003 Report from Office of Polar Programs COV
FY2004 COV Polar Research Support Section Executive Summary
FY2004 Administration Research and Development Priorities
FY2004 OPP Response to the COV Report
FY2005 Administration Research and Development Priorities
FY2006 Administration Research and Development Priorities
Government Performance Results Act of 1993
NSF Strategic Plan FY2003-2008
NSF Strategic Plan FY2006-2011
Presidents Management Agenda
Antarctic Program Solicitations
-Antarctic Research NSF 04559
-Antarctic Research NSF 05567
-Antarctic Research NSF 06549

FY 2007 NSF COMMITTEE OF VISITORS (COV) REVIEW
Office of Polar Programs – Antarctic Science
COV Responses to NSF Core Questions

Date of COV: November 6 and 7, 2006
Program/Cluster/Section: Antarctic Science Section
Division:
Directorate: Polar Programs
Number of actions reviewed: Awards: 40 Declinations: 40 Other:
Total number of actions within Program/Cluster/Division during period under review: Awards: 290 Declinations: 597 Other:
Manner in which reviewed actions were selected: NSF staff in consultation with the COV Chair developed selection distribution criteria, and NSF staff selected jackets for review. The jackets from the five science programs that constitute the Antarctic Science Section were divided into ”award” and “decline” categories by program and sorted by reviewer rating. For each program, the four top-rated “decline” and the four lowest-rated “award” jackets (40 jackets total) were selected for review. In addition, to ensure a balanced perspective of each program’s research portfolio, a random selection of four additional award and decline jackets per program were pulled for review (40 jackets). The 80 jackets were then divided nearly equally among the COV members based in part on subject-matter expertise and in a manner that avoided conflicts of interest as outlined by NSF.

PART A. INTEGRITY AND EFFICIENCY OF THE PROGRAM’S PROCESSES AND MANAGEMENT

A.1 Questions about the quality and effectiveness of the program’s use of merit review procedures.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE[1]
1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) **Comments:** From our examination of the jackets, it appears that nearly all proposals were reviewed by both an adequate number of mail reviewers and panelists. Overall it appears that Program Officers assured that a balance between the mail and panel reviews was accomplished in a fair and reasonable manner. Mail reviews together with panel reviews can give balance between scientific quality and broader impacts of the proposal and the project’s overall fit with the Antarctica	**Yes**

[1] If “Not Applicable” please explain why in the “Comments” section.

environment and NSF's mission. The COV saw no evidence of panels being used without input from mail reviews, which was viewed as a positive attribute of the program. It was also recognized that under rare, special circumstances a panel-only process may be necessary. In some cases, panelists also have been requested to submit a "mail review" and then sit on the panel. Although we recognize why this might occur, it should be avoided whenever possible to maintain the balance in the process. It was asserted that on rare occasions panelists acted as gatekeepers and overruled the mail reviews, but more commonly the panel evaluated the breadth of all reviews and brought balance to the recommendations. Consequently, it is concerning that the Antarctic Oceans and Climates Systems did not systematically use panels. The COV views this as problematic because the deliberations of panelists strengthen the mail review process and provide a broader scientific community evaluation and recommendation to the program manager. **A.1.1. Recommendation:** Standardize the use of mail reviews and panel reviews as much as possible across all programs until non-panel evaluations are the exception and noted as such. Whenever possible panelists should not also be a "mail" reviewer.	
2. Is the review process efficient and effective? **Comments:** The peer review process at NSF overall and the Antarctic Science Section, in particular, is both efficient and effective. The process has been utilized and refined over a long period of time and has earned international respect, but as with any process, it can continue to improve. The data provided suggest that the average numerical ratings of awarded and declined proposals are quite close: Award Average = 3.58 vs. Decline Average = 3.44. These results led to an inspection of what other criteria or processes (in addition to review ratings) might affect the outcome. Two issues were noted: (1) award-decision delays of 10 to 14 months and (2) logistics decisions that outweigh the review ranking of proposals. Clearly, logistics review and coordination has a major impact on the final outcome (i.e., award vs. decline). Currently, it appears that while higher-ranking proposals are under review by the logistics section, the science sections hold modestly ranked proposals without a decision. If highly ranked proposal(s) can not be supported logistically, then they are declined. Subsequently, the "held" proposals (i.e., those that were more modestly ranked) that then pass logistics review may get awarded some 10 to 14 months later. This process does not appear to consistently award the most highly rated scientific proposals in a timely manner. Although, it is recognized that not all highly ranked proposals can ever be supported logistically in the difficult and	**Yes, except for logistical issues**

remote environment in question, it seems that process and coordination could be improved such that the proposals both most highly ranked and logistically sound could be advanced as quickly as possible. Close inspection also revealed that proposals declined on scientific grounds tended to have more reviews than awarded proposals. Although taking more effort by the program manager and the reviewing community, this process may be showing more careful consideration prior to decision, which is a positive attribute in the process. It may also provide declined proposals more input for improvement or possible resubmission. Rare jackets illustrated that program managers have overridden the high ratings of mail reviews and/or both mail and panel reviews for what is noted as "programmatic" reasons. Although perhaps appropriate decision making, this was not viewed as adequate documentation of the decision making process for these rare events. **A.1.2. Recommendation:** Investigate the process of more tightly coordinating the logistical review process with the scientific review process. If possible provide to the scientific community at least a year-out look at logistics with known limitations or constraints that may help scientists target proposals to better fit logistical capabilities. See below a recommendation for piloting a pre-proposal process to assist with logistical review and coordination to improve the potential for highest ranking proposals to be awarded more frequently and all awards to be made in a timely manner.	
3. Do the individual reviews (either mail or panel) provide sufficient information for the Principal Investigator(s) to understand the basis for the reviewer's recommendation? **Comments:** Individual reviews generally are well written and clearly address scientific evaluation and reasoning for the ranking. Comments addressing the "Broader Impacts" are not as clearly stated or evenly addressed by either the PI or the reviewers. The COV is very concerned that Broader Impacts are still not well understood by the community at large, and differences in explanations among NSF Program Officers were noted. For most PIs and reviewers, Broader Impacts are an afterthought in the process, but certainly not for all. Regretfully, because of the inconsistent understanding of what constitutes Broader Impacts, some proposals receive lower ratings than appropriate while others greatly exceed what is needed in this area without being duly credited for it. **A.1.3. Recommendation:** NSF must continue to improve the documentation for the merit criteria for Broader Impacts and this information must more clearly and repeatedly be	**Yes, except for broader impacts**

distributed at the time of proposal writing and to the reviewers at the time of review. COV suggests that web links to clear and detailed explanations of Broader Impacts be included in Program Solicitations and in email letters to reviewers.	
4. Do the panel summaries provide sufficient information for the Principal Investigator(s) to understand the basis for the panel recommendation? **Comments:** The panel reviews generally were very good in evaluating the science aspects of the proposals but very limited in discussion of the Broader Impacts. Panel summaries seemed to improve over the three years. Once NSF improves the information about the Broader Impact criteria, it is advisable that Program Officers help panelists address the issue in a consistent and appropriate manner.	**Yes**
5. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification (a) for her/his recommendation? (b) for the Principal Investigator(s)? **Comments:** Review summaries were extremely detailed, quite frank, and explanations and justifications were very detailed; the COV was impressed. Program Officers provided a critical assessment of the external reviews and panel reports. It was clear that the Program Officers used all available information along with their own knowledge of the field and the community to arrive at a funding recommendation. They clearly documented recommendations in the jackets for others to understand the decision-making process and justification for results. Consistent with the flexible, decision-making approach outlined by Karl Erb at the start of the COV, the Program Officers are making well-considered funding recommendations based upon advice from the external community. Overall this clear documentation translates into adequately informing the PI as to the process, criteria, and reasoned outcomes. The information provided to the PI generally does not seem to be as robust as the internal documentation and could be improved. Program Officers have in some instances extended great effort to work with the PIs to coordinate the scientific mission with logistical capabilities, which is particularly useful to new investigators. However, other examples exist (especially in cases of logistical-capability declines) wherein little or no information is provided describing how the PI should proceed. Regretfully, it was noted that communication to the PI was very limited within the Ocean Science program and little or no guidance was provided on how to proceed on future submittals. These write-ups were the exception not the rule.	**Yes, in most programs**

A.1.5 Recommendation: Since close decisions clearly depend on programmatic goals, Program Officers should make sure the program goals are well defined for the scientific community. This transfer of information could be accomplished in some cases by more complete reports to the PIs, which include more of the details found in the Review Summary. We also recommend that Program Officers be adequately funded and encouraged to travel to scientific meetings to discuss program goals with the community.	
6. Is the time to decision (dwell time) appropriate? **Comments:** Provided data showed that the average dwell time over the three years is 9.43 months for awards and 7.2 months for declines. If the NSF target is 6 months for decisions then Antarctic Science section could improve, but logistics considerations more strongly affects the Antarctic section than perhaps any other area of NSF. The 2003 COV report for the combined Artic and Antarctic sections had recommended reducing dwell time but did not give data for comparison. Review of the jackets suggests that the long dwell time, some in excess of a year, may be related to the coordination between the science review and logistical support review. The coordination certainly needs to be improved if dwell time is to be reduced. Reducing dwell time would be helpful for PIs needing to resubmit proposals. **A.1.6 Recommendation:** A program-wide effort is needed to better coordinate science review and logistics review to reduce dwell time.	**No**
7. Additional comments on the quality and effectiveness of the program's use of merit review procedures: **Comments:** The merit review process within Antarctic Science is well managed and internally well documented with the exceptions noted above. The declines commonly seemed reasonable, but up to 3 out of 5 declined proposals were declined because of logistical limitations that were assessed after the science review and panel process. These proposals were sometimes the most highly related submissions of the cycle reviewed. This situation suggests that OPP needs to better identify to the community what and when certain types of research will be supported with anticipated logistical capabilities. Without this information, both the community and NSF waste considerable effort, and the best proposed projects may not be carried out. Why some awards to modestly ranked proposals were made was not always clear. Award decisions may be influenced by the PIs extensive Antarctic	

experience, or because Program Officers are trying to reach goals set by NSF including but not limited to new investigators, women and minorities in science, broader "programmatic" impacts, or K-12 education components. The term "programmatic" reasons is noted but not well understood by the COV. These decisions may be related to NSF goals known to the Program Officers, but Program Officers do not state such in the review summaries. More explicit statements internally of program goals and important decision making criteria may be useful. The COV concurs that the best science needs to be funded whenever possible regardless of the "programmatic" demands across the NSF initiatives. In the datasheets provided that denoted rankings from panel reviews and from mail reviews documented an inconsistent process. In some cases, the numerical review score denotes only mail reviews, whereas in other cases it includes ratings from several panelists. **A.1.7 Recommendations:** Entry of ratings on the data spreadsheets should be done consistently according to protocol. Ratings that panelists give should not be included in the review score/average. If a reviewer is both a mail reviewer and a panelist, then the score should be entered once, and we recommend it be only as a panelist.	

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (<u>intellectual merit</u> and <u>broader impacts</u>) by reviewers and Program Officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	**YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE**[2]
1. Have the individual reviews (either mail or panel) addressed both merit review criteria? **Comments:** Individual reviews more strongly and more consistently address the intellectual merit of proposals than the merit of the broader impacts. **Recommendation:** See A.1.3 above.	**Yes**
2. Have the panel summaries addressed both merit review criteria? **Comments:**	**Yes**

[2] In "Not Applicable" please explain why in the "Comments" section.

Panel summaries more strongly and more consistently address the intellectual merit of proposals than the merit of the broader impacts. **Recommendation:** See A.1.3 above.	
3. Have the review analyses (Form 7s) addressed both merit review criteria? **Comments:** Program Officer review summaries address scientific merits strongly and consistently. Limited discussions of the merit of broader impact activities are included in the summaries. Generally, within the Broader Impact category, rationale for why activities are meritorious is not clearly delineated nor are the activities and results reported, tabulated, or evaluated in progress reports. **Recommendation:** See A.1.3 above.	**Yes, with exception as noted in A.1.3**
4. Additional comments with respect to implementation of NSF's merit review criteria: The written review summaries provided to the PI should include a full discussion of the evaluation of both merit categories. Guidance should be given on the increasing importance of addressing both areas, and the types of activities and results that may apply to the Broader Impacts category.	

A.3 Questions concerning the selection of reviewers. Provide comments in the space below the question. Discuss areas of concern in the space provided.

SELECTION OF REVIEWERS	**YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE**[3]
1. Did the program make use of an adequate number of reviewers? **Comments:** The average number of reviewers is quite high: between 6 to 7 reviews per proposal. The Program Officers should be commended for doing an excellent job of gathering sufficient reviews. The number of reviews for declines is slightly	**Yes**

[3] If "Not Applicable" please explain why in the "Comments" section.

greater than for the awards, which suggests that proposals are not being declined for lack of information. Limited evidence suggests that the Ocean Sciences program tends toward fewer reviews and fewer requested reviews per proposal, and it is the one program that consistently does not use a panel. **A.3.1 Recommendation:** Ocean Sciences should request more reviews and require more reviews prior to making decisions. Ocean Sciences should also consider using panels more regularly to be consistent with other programs.	
2. Did the program make use of reviewers having appropriate expertise and/or qualifications? **Comments:** Program Officers have done an outstanding job in seeking appropriate expertise for reviews. Even when some reviewers declined because they thought that they lack sufficient expertise, the Program Officer found a sufficient number of qualified reviewers. That said, of the reviewers who self identified ethnicity or sex, there seems to be a disproportionate use of senior male scientist as reviewers. One could argue that this group has the experience and expertise to review the proposals, but data on gender and ethnicity in the science community suggest that others are equally capable in reviewing the proposals. **A.3.2 Recommendation:** Program Officers need to make every effort to include in the review process new and emerging scientists and other available scientists to bring a higher diversity to the review process including international reviewers while maintaining the highest of standards for quality of reviewers.	**Yes**
3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups?[4] **Comments:** From the data provided, it is difficult to fully address this question. Because race, class, ethnicity, and sex are generally self disclosed and not required, the distribution of reviewers by these attributes can not be fully assessed. However, the 2003 COV noted that they had no data with which to respond and this year data are available from about 20% of the reviewers. In regards to disability status, the status is unavailable for 78.80% of the reviewers and only 0.24% responded in the affirmative to a disability status. In	**Yes**

[4] Please note that less than 35 percent of reviewers report their demographics last fiscal year, so the data may be limited.

regards to minority status, the status is unavailable for 78.80% and only 0.81% affirmed a minority status. Reviewers by gender (sex, actually): data unavailable for 78.80% of the reviewers, 5.89% declared female, 14.46% declared male, and 0.85% did not declare. Our review of the jackets, however, revealed that the list of reviewers very commonly had male and female status recorded; certainly more frequently than the data tables would suggest. From our evaluation of the jackets, it appears that there is a disproportionate use of senior male reviewers. This practice does not address the issues of increasing the diversity of and advancement in the scientific workforce for traditionally marginalized scientists. The NSF review process helps new and emerging scientists as well as marginalized members to better understand the system and thus to better compete within the system. In the data tables of reviewers by institution type, the preponderance are listed in the category "Business, State & Local, Foreign, Other." From the distribution of reviewers by state, we find that 20% of the reviewers are international, and only 1% are unknown. Even after removing foreign reviewers, the "Business, State & Local, Foreign, Other" category remains the largest of the categories, and this is puzzling. One hypothesis is that this category is dominated by "Other," but what that means is not known. If the entire "Business, State & Local, Foreign, Other" category is removed (including the international reviewers), the remaining percentages track reasonably well the distribution of affiliation from which proposals usually are submitted. **A.3.3 Recommendation:** The COV very much encourages the use of international reviewers across all programs. At present, they are commonly used by many of the programs but Biology and Ocean Sciences are low in this area. A good balance in all programs could be achieved by using many international mail reviewers and national panelists. NSF data collection methods need to improve to more fully evaluate these issues. Trusted anonymous self disclosure may need to be encouraged and recorded. It is recommended that Program Officers be funded to attend more national and international meetings to see the work of and meet more scientists, particularly the emerging scientists, in an effort to diversify the reviewers relative to race, class, gender (sex) and ethnicity as well as those who submit proposals.	
4. Did the program recognize and resolve conflicts of interest when appropriate? **Comments:** On the rare occasions that disagreements apparently arose, the Program Officers seemingly resolved them and documented them very well.	**Yes**

5. Additional comments on reviewer selection: Overall Program Officers in the Antarctic Sciences Program should be commended at their efforts in selecting and seeking a broad range of experts to fully evaluate and write reviews of proposals and act as panelist. **A.3.5 Recommendation:** (a) NSF needs to better fund national and international travel for Program Officers to assure that they are well informed about new and emerging scientists, experts in the field, and the breadth of diversity in the scientific community to draw the best pool of reviewers possible to NSF service and to encourage a diversity of scientists to participate in the NSF proposal process. (b) In addition, NSF needs to continue to improve its social science database to answer distinctly different questions than the financial database. (c) The database used to record mail review scores and panelist scores needs to be more systematic in data recording. For example, if a person is both a mail reviewer and a panelist then the score should be entered once, and we recommend it be only as a panelist. It is also recommended that there be a mail review average distinct from a panel average.	

A.4 Questions concerning the resulting portfolio of awards under review. Provide comments in the space below the question. Discuss areas of concern in the space provided.

RESULTING PORTFOLIO OF AWARDS	**APPROPRIATE, NOT APPROPRIATE[5], OR DATA NOT AVAILABLE**
1. Overall quality of the research and/or education projects supported by the program. **Comments:** The overall quality of proposals and awards is scientifically very high. The COV has some concern, however, that some best proposals are not getting funded because of logistic constraints and perhaps a lack of logistical and science programming coordination as was addressed in A.1 questions. Most of the projects included some educational aspects involving K-12, informal public education, teachers, and graduate students. These projects appear to be quite reasonable in quality and attempt to have a broader impact.	**Yes**

[5] If "Not Appropriate" please explain why in the "Comments" section.

The Young Investigators and Post-Doctoral Programs are excellent. **A.4.1 Recommendation:** Coordination between scientific and logical planning needs to be improved and the scientific community needs to be better informed of the plan. COV highly recommends continuation of the Young Investigator and Post-Doctoral Program.	
2. Are awards appropriate in size and duration for the scope of the projects? **Comments:** The size and duration of scope for the projects appear to be well developed and seem to not exceed 3 years in most cases. If well justified, a project length of 4 or even 5 years would be beneficial to the scientific community; would better match polar field work and its data analyses cycle; would improve the success rate of projects; and would enhance recruiting and retaining graduate students, post doctoral fellows, and scientists into the research program.	**Yes**
3. Does the program portfolio have an appropriate balance of: Innovative/high-risk projects?[6] **Comments:** Program Officers seem to be supportive of innovative projects particularly if the logistical requirements were minimal. In some cases, projects received reasonably positive mail reviews with an added notation of being "risky" in nature. In these cases, the panel recommended not funding due to risk, which is inconsistent with the documented decision by Program Officers to recommend the funding of an innovative and possibly risky project. We have some concern that "routine" projects that challenge logistical norms, and innovative projects that have high logistics cost may have difficulty getting funded. Of new awards, 2% were funded as SGER indicating possibly risky or innovative proposals.	**Yes**
4. Does the program portfolio have an appropriate balance of: Multidisciplinary projects? **Comments:** Program Officers generally are doing an excellent job in encouraging and facilitating the development of multidisciplinary projects. Positive examples of such efforts include the SO GLOBEC, ANDRILL, SHALDRILL, WAIS	**Yes**

[6] For examples and concepts of high risk and innovation, please see Appendix III, p. 66 of the Report of the Advisory Committee for GPRA Performance Assessment for FY 2005, available at <www.nsf.gov/about/performance/reports.jsp>.

Divide Drilling and Center for Remote Sensing of Ice Sheets (CReSIS). Regretfully, if a large project that groups many small proposals is not successful, then none of the small proposals of merit within the group are segregated out, reviewed, or funded. Both the small collaborative proposals and larger science group proposals address the multidisciplinary aspects of Antarctic science. From the data provided, about 50% of the new proposals funded were collaborative. The Glaciology and Geology program as well as others use workshops to stimulate collaborative and group proposals that both improve the science and maximizes logistics while helping to drive logistical planning. Of new awards, 4% were funded for workshops. The number of cross-directed, co-funded projects also attests to the interdisciplinary nature of the Antarctic science projects.	
5. Does the program portfolio have an appropriate balance of: Funding for centers, groups and awards to individuals? **Comments:** The COV can not respond fully to this question because we only reviewed proposals from individuals or individuals forming larger project-oriented groups that are informally joined together to investigate systems such as ocean, climate, biomedical, or geology etc. Typically, atmospheric science only has one or two investigators, and geology appears to have two to four investigators. Programmatic funding decisions appear to be made on the reviews of the science not the size of the team, but it is recognized by reviewers and Program Officers that a wide range of experience is necessary to address complex problems. Some large programs are reviewed systematically and wind down over time.	**Data not available**
6. Does the program portfolio have an appropriate balance of: Awards to new investigators? **Comments:** Of the proposals submitted to Antarctic Sciences, 23% were from investigators new to NSF. They received 7% of the awards demonstrating a 30% success rate compared to the 34% success of all proposals, which is quite reasonable. Of the jackets reviewed, we did not see that number reflected; the percentage appeared lower. Space physics had one proposal from a new investigator that was recommended for funding on merit, and the Program Officer made sure that it got funded. The reviewers are also helping in highlighting quality proposals from new investigators.	**Yes**
7. Does the program portfolio have an appropriate balance of: Geographical distribution of Principal Investigators?	**Data not available**

Comments: California attracts a disproportionate level of funding, accounting for 19.1% of funding, with three states (New York, Washington and Massachusetts) accounting for an additional 20.8% of funding. Overall, 49 states receive some level of funding, which is consistent with the previous COV. **A.4.7 Recommendation:** NSF should provide further data and analyses to allow accurate assessment in the future. Without further statistics on population, number of incoming proposals, and distribution of Antarctic research activity/interest across the states, it is not possible to comment on whether the level of funding to each state is appropriately balanced.	
8. Does the program portfolio have an appropriate balance of: Institutional types? **Comments:** We presume that this question is asking about distribution of different types of institutions of higher education. With that assumption, the breadth of institutional types is consistent with the objectives identified in the NSF Strategic Plan. By far, the largest number of awards distributed to institutions of higher education go to Research Intensive Ph.D. Institutions (58%), about 17% to Non-Research Intensive Ph.D. Institutions, 5% to Masters granting Institutions, 18% to Business, State and Local, Foreign, Other Institutions, and 2% to Four-Year Institutions. The FY 2003 COV recommended that Polar Programs "to be proactive and creative in encouraging participation for undergraduate institutions." There has been no noticeable change. Not included in the data available nor elsewhere in this review is the proportion of funding for Antarctic Science projects that is dispersed to national laboratories and other federal agencies in support of science activities such as NASA, USGS, Godder Space Flight Center, and JPL. **A.4.8 Recommendation:** It seems appropriate that the best science being funded is coming from the top tier institutions, but NSF must provide additional criteria for the COV to assess whether or not the distribution is balanced and appropriate. In terms of data reporting, there may be value in splitting out business/non-profit institutions as a separate category from State & Local/Foreign/other. A statement of OPP policy on appropriateness of including funding for federal agencies, labs, or individuals at those agencies or labs in proposal budgets is needed. Are these facilities and individuals funded through another mechanism? Will their inclusion in proposals increase the budget	**Yes**

sufficiently that the proposal will not be awarded? It would be helpful if OPP could provide statements on how national labs, NASA, and interagency programs that support Antarctic Science get funded. Reviewers should be well informed of NSF's policy on this.	
9. Does the program portfolio have an appropriate balance of: Projects that integrate research and education? **Comments:** Almost all proposals incorporate graduate students, and some involve undergraduate, K-12, and public outreach components. Graduate students seem to be important components of proposals from Ph.D.-granting institutions. The FY 2003 COV perceived a reduction in the number of graduate students in proposals during budget negotiation. The 2003 COV did not perceive this problem except in one limited case. It was noted, however, that when budgets are being negotiated PIs tend to have to support "soft-money" personnel first to maintain continuity in programs and expertise in laboratories. Therefore, cutting out money for graduate students who have not yet been recruited or who may be paid for by the intuition in the form of fellowships or teaching assistantships may give the appearance of cutting out graduate students when it is, in fact, a reallocation of funding sources.	**Yes**
10. Does the program portfolio have an appropriate balance: Across disciplines and subdisciplines of the activity and of emerging opportunities? **Comments:** From the review of a subset of jackets from the program, we can not fully address the entire program portfolio, but it appears to have breadth across disciplines and subdisciplines. In part from the COV's personal knowledge of funded Antarctic research, they think the portfolio is a broad representation of disciplines and subdisciplines.	**Yes**
11. Does the program portfolio have appropriate participation of underrepresented groups? **Comments:** Our own analysis of the extended spreadsheet that was provided, rather than the small data tables that were provided, suggests that of the awards 3% had minority involvement, 23% women investigators and 13% new investigators, and 19% new involvement. These numbers are significantly lower than the NSF data available on distribution of race, ethnicity, and gender (sex) of Ph.D. scientists in the U.S. and currently graduated, but more analyses of data are necessary to fully understand why. **A.4.11 Recommendation:**	**No**

Further work is needed to increase the participation of women, minorities and new investigators in the Antarctic Program. Perhaps collaborating with the NSF ADVANCE program, or other NSF social science and education programs could assist in creating a plan for change.	
12. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. **Comments:** As stated on the United States Antarctic Program web portal, USAP supports scientific research in Antarctica and the Southern Ocean. The NSF manages the program under guidance of a Presidential memorandum that directs and "active and influential presence in Antarctica designed to support the range of U.S. Antarctic interests." The USAP carries forward the Nation's goal of supporting the Antarctic Treaty, fostering cooperative research with other nations, protecting the Antarctic environment, and conserving living resources. Since 1956, Americans have been studying Antarctica and its interactions with the rest of the planet. Research disciplines include glaciology, biology and medicine, geology and geophysics, oceanography, climate studies, astronomy, and Astrophysics. Contractors and units of the military provide operational support. From a review of the program as presented by NSF staff, on documented activities on the web, and through a review of a subset of the last three-years program jackets, the COV argues that the Antarctic Science Program is clearly relevant to national priorities, is consistent with the directives in Presidential memoranda, and follows and supports the mission of NSF. NSF's mission statement is in part "to promote the progress of science." The high quality of science funded to be conducted in Antarctica and to address complex physical and biological systems is unquestionably consistent with NSF's mission. Examples of important documents include, but are not limited to, the Solar and Space Physics Decadal Survey, the Astronomy Decadal Survey, the Polar Biology National Academy Report, A Vision for the International Polar Year, and the Frontiers in Polar Biology Program 2003. Antarctic Science includes educational and outreach programs that address the People goal in the NSF strategic plan. This goal is also supported by the new Post-Doctoral Program and the new investigator workshops. Antarctic projects speak directly to the Presidential Memorandum from the Office of Science and Technology Policy in the areas of R & D priorities: Biology of Complex Systems; Climate, Water, and Hydrogen; the arena of life and climate on Mars; and national energy and environment priorities.	**Yes**

Other examples include NSTC and "Augustine" panels of the mid-1990's that set the direction to rebuild the South Pole Station as one of the rare example of a major research facility managed by NSF. Also included in this list are the MREFC project IceCube and the new STC – CreSiS.

The U.S. scientific community is very interested in Antarctic science research, and the community drives the direction of research by submitting quality proposals. The proposal pressure, workshops, and interagency and international activities prove the robustness of the program and its response to national and international initiatives and priorities as well as scientific priorities set by the science community. An example of such would be the drive by the National Academy of Sciences for the International Polar Year initiative.

The global relevance of the program is illustrated by research on the interactions of the Southern Ocean, ice sheets, and atmosphere that play a critical role in international policy development.

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

The projects are of high quality and address important fundamental scientific issues as well as nationally and internationally relevant societal issues. The portfolio is well balanced with respect to disciplines, project sizes, institutional funding distribution, and spectrum of participants.

A.5 Management of the program under review. Please comment on:

1. Management of the program.

Comments:
The Antarctic Science program overall is very well managed at all levels. It has continued to strike a balance between large long-term projects that may be very expensive and single investigator/small group projects. The development of unique facilities to meet emerging research needs such as IceCube - the neutrino observatory and the West Antarctic ice drilling project are but two of many examples that demonstrate flexible and balanced management. Excellent management databases are well established; repositories for samples are inventoried and housed for future researchers; and long-term monitoring is well maintained. Incorporating broad-based initiatives for research and education into the structure of Antarctic Science such as the International Polar Year has been very successful and clearly demonstrates the excellent management of the unit.

The COV suggests that the Astronomy, Biology Medicine, Glaciology, and Geology and Geophysics programs have been exceptionally well managed over the review period. Of note are the excellent very detailed review summaries and the program officers have worked very well with PIs providing seed funding when appropriate to encourage new participation. Some of the review

summaries may be used as an example of "Best Practices" for staff development. The Astronomy program also shows excellent management of large ongoing projects that were reviewed, and when appropriate, a wind-down process was developed in a thoughtful manner with good communication to the community. Ocean Science seems to be well managed in some respects, but written communications to investigators is less clear and community participation in the program is not as broadly distributed or robust because of the limited number of reviewers; the lack of panels; and limited workshops providing ways for the science community to drive the research direction. Consequently, the program appears to not be as responsive or engaged as the other programs.

A.5.1 Recommendations:
We strongly encourage the immediate filling of the vacancy for the Program Officer at AAA.

Overall communication between logistics and science programs must be improved so that the proposal review and implementation process can run more smoothly and the best-of-the-best science proposals can consistently be funded.

All Program Officers and administrators need to continue to look for useful ways to engage underrepresented groups.

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

Comments:
Across the board, Program Officers and administrators enthusiastically embrace emerging research and education opportunities. An excellent example of the enthusiasm is the full participation in the International Polar Year initiative to advance research and education. Also, examples can be seen in the development of the MaudNESS project, which incorporated much pre-planning for multiple investigators over multiple years to investigate complex processes at the Maud Rise; ANDRILL and ShalDril, which are retrieving the earth's sedimentary record to address global climate change; and the Latitudinal Gradient Project, which is a large multi-investigator, multi-project program with international collaboration with Italy and New Zealand resulting from investigator driven workshops. In addition, the new 10m South Pole Telescope and CReSIS project for remotely sensing ice sheets were science community driven projects that were embraced by the Program Officers.

The above examples are generally large-scale projects, but many small-scale projects are equally important in demonstrating the responsiveness of Antarctic Science Program Officers. These may be illustrated by the use of seed money to new investigators, the use of SGER funding, and the development of the new PolarTREC program for education to replace the old TEA.

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

Comments:

From the documentation provided, this question is difficult to address. The programs are primarily proposal driven using the merit review process to rank the projects to be awarded. The science community is encouraged to develop workshops and planning meetings to drive big projects and to delimit areas of emerging research interest. Both of these activities are excellent and should be the primary vehicles that drive the science. The Program Officers appear to be responding to proposal pressures and staying in touch with the science disciplines to understand the needs and demands of the scientists. The National Science Board, the National Academy of Sciences, and other national bodies and agencies also influence the science priorities in the nation to which NSF must respond. It was noted that the fields included within the International Polar Year program announcements are not the same as those recommended by the National Academy of Sciences committee, so there are areas of negotiation. Within Antarctic Science, the projects actually awarded are constrained by the ranking of the proposals, the available logistical support, and the budget available. Because we do not review the logistics planning, we do not know how those priorities are set, how the decisions are made, or what the direct impact those decisions have on the awarded science activities. It is also unclear how the budgets get set or prioritized for each program area within Antarctic Science, how flexible that distribution could or should be over time, and what the planning and prioritizing criteria are that help guide the distribution of program funding.

The actual internal priorities within Antarctic Science or the multiple criteria used in the decision making are not known by the COV. In review summaries, the Program Officers write an evaluation of the quality of the science proposal but do not state that decisions to fund or not fund the proposal were based on meeting particular internal goals or priorities of the program or section or even advancing NSF's goals as stated in the strategic planning document. There is no clear, objective set of multiple criteria used to inform the decision-making process. Proposals do not overtly address strategic planning goals within NSF or OPP or Antarctic Science nor do the evaluations internally or externally. There does not appear to be benchmarks against which Program Officers make decisions based on priorities. The new investigator awards, post doctoral fellows, and early career awards are evidence that an effort is being made to encourage development of new scientists in the field of Antarctic Science. Is this a criteria used to decide to fund one proposal over another of equal scientific quality?

It appears that the core of planning is to allow excellent science drive the funding priorities, which the COV views as appropriate, but many other factors influence the final outcomes. Exactly what all those factors are could not be discerned from the documentation provided.

4. Additional comments on program management:

The COV concurred that the over all management of the program is very good and a remarkable amount of excellent science is conducted each year in one of the most remote areas of the world.

PART B. RESULTS OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to the first three (People, Ideas, and Tools) questions in this section are to be based on the COV's study of

award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also include consideration of significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when the investments were made. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

B. Please provide comments on the activity as it relates to NSF's Strategic Outcome Goals. Provide examples of outcomes (nuggets) as appropriate. Examples should reference the NSF award number, the Principal Investigator(s) names, and their institutions.

B.1 <u>OUTCOME GOAL for PEOPLE</u>: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."

Comments:
In reviewing the Antarctic Science projects and initiatives, the COV thinks a number of the activities correlate to the NSF goal of people and view the current work in this area as exemplary. Nearly all proposals contained funding for graduate students and some for post doctoral scholars, which specifically trains a high quality workforce. In addition, the new investigator workshops are assisting new scientists to get involved with NSF-sponsored projects and respond to calls for proposals. Educational courses have been held in Antarctica, specifically a biology course and geology course that have encouraged new scientists to engage with Antarctic research. PIs are encouraged to use the REU and ROA initiatives to include funding for more educational activities

related to funded projects. OPP had developed a PostDoc program in an effort to increase the educated workforce. Antarctic Science, at the encouragement of the 2003 COV, developed and will fund the new PolarTREC education initiative that will replace the TEA. Program Officers and other Antarctic Science personnel attend national and international science meetings to encourage participation in the NSF sponsored research and education programs. An outstanding example of a small project could be the Percolate in Sea Ice project [9725038 Golden, University of Utah] that included scientists from seven disciplines and involved undergraduate students in the research. One of the students gave presentations at the Undergraduate Mathematics Research Conference at Ohio State, and exhibitions for members of the US Congress and White House representatives on Capitol Hill, and to the Utah Sate Legislature. The Under Antarctic Ice education project funded through the Antarctic Artist and Writers program is also an excellent example of meeting the People Goal of NSF [0000373 Yelvington, Raytheon Technical Services Co, LLC]. An example of a large project with this goal in mind is the educational outreach part of ANDRILL that includes 10 post-docs, 16 graduate students, 16 undergraduates, 7 teachers, and a national network of teachers. It also has used the university television to connect to museums as well as NOVA.

B.2 OUTCOME GOAL for IDEAS: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

Documents provided to the COV clearly demonstrate the outstanding effort that Antarctic Science personnel are making to meet the NSF goal for ideas. Antarctic Science is funding proposals that explore excellent science ideas. These ideas and proposals are typically the result of collaborative, multi-institutional, and a variety of investigators, both national and international, driving major projects. Some such projects include but are not limited to AMANDA (Antarctic Muon and Neutrino Detector Array) [09980474 Morse, University of Wisconsin-Madison; 0099367 Barwick, University of California-Irvine], Antarctic Geomorphology – Clues to Understanding Mars [0125330 Marchant, Boston University, Collaborative Proposal], ITASE (International Trans Antarctic Scientific Expedition) [0440679 Mayewski, University of Maine], Understanding the Boundary Conditions or the Lake Vostok Environment [9978236 Bell, Columbia University], AGASEA (Airborne Geophysical Survey of Amundsen Sea Embayment, Antarctica)[0230197 Holt, University of Texas at Austin], the West Antarctic Ice Shelf Divide Drilling project, SHALDRIL, ANDRILL, SO GLOBEC, and the two LTER programs (Dry Valleys and Palmer).

Also, many single-investigator or small group projects are funded that are the result of creative science ideas that have a wide diversity within subdisciplines and across disciplines. A few examples include Genomics networks for cold-adaptation in embryos of polar marine invertebrates [0238281, Marsh, University of Delaware], Percolate in Sea Ice and Paleohistory of the Larsen Ice Shelf System, and Did Modern Birds Coexist with Dinosaurs? [SGER award Clark, North Carolina State]

Much of the work in Antarctic is or will become a service to society including the studies of the ozone hole, past climate record (WAISCORES, ITASE), modeling atmosphere, cryosphere, hydrosphere, and biosphere interactions to predict the effects of future climates. Two examples include [Deshler 0538679] Measurements Addressing Initial Stages of Ozone Recovery and John [Holt 0230197] Understanding a Changing Ice Sheet.

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices."[7]

Comments:
A testament to organizational excellence is the fact that outstanding science is now conducted routinely in Antarctica using state-of-the-art tools and is supported by an excellent infrastructure. The Antarctic Science section responds directly to the pressures of scientists and organizes the infrastructure and tools needed to meet the demands. They are responsive and well organized.

State-side, the development and use of the NSF Fastlane system has been a wonderful achievement that allows rapid distribution of solicitations, proposal submittals, mail reviews, panel reviews, and PI notification. It is with significant regret that the U.S. government's change to GRANTS.GOV and its resultant cumbersome interface will systematically downgrade or debilitate what was a very efficient electronic process. The NSF internal process to manage Committee of Visitors and supply them with electronic jackets for all declines is excellent. The effort should be commended at all levels. In the future, if all awards could be in the e-jacket system it would be even better.

PART C. OTHER TOPICS

Recommendations:

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

C.1.a Recommend
Reviews dealt fairly with the intellectual merit and broader impacts criteria. Nevertheless, the intent and acceptable range of broader impact activities is not well understood by the science community. For example, it was surprising to the COV that publishing papers can be viewed as Broader Impacts. Therefore, we recommend that the Program Officers discuss broader impact categories and the purpose of the merit category with the community at workshops, town hall meetings, and more fully in any review summaries, letters, etc.

C.1.b Recommend
Upon reviewing comments in mail and panel reviews the COV found evidence to suggest that PIs should be given a very short timeframe to comment on the review statements to briefly (less than a page) clarify any misunderstandings, or errors the

[7] For examples and further detail on the Organizational Excellence Goal, please refer to pp. 19-21 of NSF's Strategic Plan, FY 2003-2008, at <http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf04201>. Please note that there will be a new Strategic Plan in FY 2007.

reviewers may have made. NSF might consider testing a shorter commenting timeframe within a particular program.

C.1.c Recommend
Improve the coordination of review between the logistical section and the science section to provide more rapid decision making and the awarding of more high quality proposals. During the logical review with the science section the PI should be allowed the opportunity to modify their logistics plan if that is the only reason a proposal is not funded. (See discussion in other sections of report).

C.1.d Recommend
Standardize the review process so all programs use panels as often as possible. When at all possible, mail reviewers should not also be on the panel. Mail reviews should be the only scores on Form 7 and the panel outcome should be noted.

C.1.e Recommend
Members of the COV would like to see the development of a clear and transparent mechanism that will manage and evaluate system science that does not fall specifically into a program area or may be global or bipolar in nature with an Antarctic component.

C.1.f Recommend
Antarctic Science seemingly does not have a stated long-term monitoring obligation budget similar to NOAA, although Antarctic Science has the obligation for such activities (e.g., automatic weather data, seismic, sea ice, space, atmospheric, ocean color and ecosystems). Similarly the establishment of a long-term equipment use budget plan that researchers are aware of would be excellent.

C.1.g Recommend
Broader Impacts: What activities and outcomes fall into this area? Guidelines as to what is considered sufficient in this category and what is considered outstanding in this category need to be made clearer at all levels of Antarctic Science, and NSF for that matter, and the criteria need to be consistently applied.

C.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.

Science ideas from the scientific community drive the program, which is very appropriate.

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

Establish a continuing funding stream for Antarctic long-term monitoring much like the national programs of land and sea.

Do not convert to GRANTS.GOV when you have an excellent program in Fastlane.

Agency-wide databases need to be improved to answer questions regarding race, gender (sex), ethnicity, and other demographics. An agency-wide questionnaire needs to be developed and returned by the PI with each proposal submittal and submitted by each reviewer.

Program Officers' travel budgets are far too limited preventing them from attending major national and international scientific meetings and workshops or to particular institutions to engage and stimulate proposal development and diversity. The travel budget must increase.

Clarify to the community what is intended by the Broader Impacts. The categories of activities that are appropriate in this category need further explanation and then the evaluation of those activities needs to be consistently applied.

C.4 Please consider the comments/recommendations of the previous COV and assess if possible whether/how these have been addressed or whether they remain a concern.

1. Recommendation: Declination letters, including access to the reviews should proceed on as fast a track as possible; in order to allow timely submission of revised proposals.

   Comment: The program has responded to this recommendation and generally the situation seems to be improving

2. Recommendation: OPP should consider sharing examples of exemplary write-ups by Program Officers across the Office, thereby helping everyone continuously improve the quality, thoroughness, completeness, and clarity of these documents.

   Comment: PI letters should accurately reflect the information in the Review summaries as much as possible. "Best practices" still need to be employed across the program for a bit more consistent reporting. The Program Officers have positively responded to this recommendation and general improvement is ongoing.

3. Recommendation: OPP should continue to expedite decisions, strive to reduce dwell time, and notify PIs promptly. It is especially important to provide reviewer comments to PIs on declined proposals, at least one month before the next proposal deadline (typically semi-annual).

   Comment: Average dwell time is still high in some programs.

4. Recommendation: To provide specific measures of its contributions to NSF's Outcome Goal for People, OPP should try to develop statistics on the total number of undergraduate, graduate, and postdoctoral researchers receiving support from OPP awards, and also on the number of Masters and Ph.D. degrees produced in the course of OPP-funded research projects. It would be useful if this data could be sorted according to specific programs in both Arctic and Antarctic science sections and reduced to percentages in order to aid comparisons. The COV recognizes that it will be difficult to collect quality data of this type, and acknowledges that the community must be involved.

   Comment: Data are still needed to fully respond to questions regarding the total number of undergraduate, graduate and postdoctoral researchers receiving support. These data would be difficult to generate, but if the answer is important then a mechanism needs to be developed.

5. Recommendation: OPP should ascertain whether the exclusion or reduction of budget line items for graduate student support has impacted the number of young scientists supported and graduated to any significant degree, and to follow up, as necessary.

   Comment: The COV did not find any evidence of this problem.

6. Recommendation: OPP should continue to be creative and proactive in encouraging the participation of PUI (Predominantly Undergraduate Institutions) in the research process, including encouraging partnering between DRUE/I and other institutions and also use of RUI (Research in Undergraduate Institutions) and REU (Research Experience for Undergraduates) programs.

   Comment: Antarctic Science seems to be trying to respond to this recommendation and they should continue doing so because the level of funding to undergraduate institution remains low (less than 2%)**.** No data on minority institutions.

7. Recommendation: The COV encourages OPP to continue to be creative and proactive in this area and attempt to further increase the proportion of underrepresented groups.

   Comments: We see no indication of increased awards to women and minorities, so the efforts need to continue to diversify the PIs.

8. Recommendation: OPP, perhaps assisted by its Advisory Committee (OAC), should attempt to answer the following questions, and rectify imbalances or unintended consequences, if they exist.

a. Is each program appropriately staffed to balance the workload among programs?

Comment: This staffing issue may have been corrected with the division being developed. We did not see any imbalance with in Antarctic Sciences.

b. The Arctic and Antarctic programs are organized rather differently. This may be perfectly appropriate, but it raises the question of whether OPP overall is optimally structured?

Comment: This organizational issue may have been corrected with the division being developed.

c. Given the number and scientific diversity of the proposals submitted to ANS, is its current organization and approach optimized?

Comment: This organizational issue may have been corrected with the division being developed.

d. Would panels be feasible and valuable for providing a coherent ranking of proposals in ANS? Would mail reviews provide important additional information for panel use in ARCSS?

Comment: Panels are typically used in ANS. The organization at ARCSS was not reviewed.

e. The proposal success rate appears to be quite variable across OPP programs. Are these differences appropriate or should program allocations be flexible to respond to variations in proposal pressure and quality?

Comment: We see a reasonably good balance of funding rates across programs: lowest 25% Oceans funding rate, Biology Medicine 28%, Geology and Geophysics 39%, Glaciology 42%, Aeronomy and Astrophysics 42%, and Postdoc 20%

f. In some cases, OPP requests that PIs adjust their proposals to fit within a budget below what is requested. It appeared to the COV in its review of jackets, that budget reductions were disproportionately taken by reducing graduate student support. What is the impact of budget reductions on the research and on the inclusion of graduate students in the research?

Comments: We did not see a problem with funding graduate students. In fact, they look to be included and funded in most proposals.

g. It appeared to the COV that proposals with only three mail reviews were more likely to be declined than proposals with larger numbers of reviews and/or consideration by a panel. Is this observation accurate?

Comments: From our perspective, there are lots of reviews and in fact there are more reviews for those proposals that are declined than for those awarded. Both categories however nearly always have a large number of reviewers.

9. Recommendation: That OPP, assisted by its Advisory Committee (OAC), develop answers, and, as appropriate, statistics on the above questions during the next three-year period and provide these data to the next COV committee.

   Comments: Many data summaries were provided, but we still needed to extract data from the master spreadsheet. NSF staff should specifically populate the COV template/questions with the needed data to answer the specific questions. The COV could spend more time commenting on results if they were readily available and did not have to be extracted.

10. Recommendation: OPP should enable teacher participation in polar research to continue into the future, even as TEA comes to an end. There should also be a mechanism found to continue follow-up support of the existing cadre of TEA teachers.

    Comment: This recommendation was responded to very well with the development of the PolarTrec program.

11. Recommendation: The Arctic and Antarctic science sections should consider engaging with the community to conduct a series of 'future workshops' or 'think tank meetings' which focus on the coupling of bipolar science, the integration of polar-derived data with global programs, the elucidation of new cutting edge opportunities between disciplines, involvement with agency-wide initiatives, etc.

    Comment: Antarctic Sciences has responded to this very well. Polar marine science using Gordan conferences has been useful. Atmospheric community with NSF support has organized to do bipolar meteorology. Space science programs work together through SCAR to identify and conduct global scientific investigations. NSF and Antarctic Science need to continue to support workshops for integrated scientific efforts.

12. Recommendation: OPP should seek adequate budgets to support the development of new polar research instrumentation, link polar research instrumentation development opportunities directly to research needs in the Arctic and Antarctic, issue regular solicitations in this area, and increase the number of awards for technological innovation and development.

    Comment: OPP has been quite aggressive at encouraging PIs to utilize Major Research Instrumentation (MRI) and the Science and Technology Center NSF initiative. COV thinks it is better to leverage other NSF funds for instrumentation, but when appropriate OPP could help facilitate such processes as they have done or contribute to the process through a solicitation.

13. Recommendation: The NSF should standardize its data collecting and reporting procedures at all administrative levels and across all Directorates, Divisions and Offices; ensure that non-sensitive data be available on-line; provide complete indexing and cross-linking for these data; and enable effective graphical formats for such data. Also, NSF should ensure that it collects and makes readily available to the COVs in advance whatever data are needed to answer the questions it sets for COV reviews of Directorates and Offices.

    Comment: OPP has made improvements in this area by helping develop the e-jackets and developing a website with data for COV this time. COV electronic information and e-jacket are very good. Continued improvement in the database, clarification of terms, and how the data are entered is important. Improvement is noted and should continue.

14. Recommendation: The relevant programs within NSF should examine the issue in depth and develop policies and guidelines for dealing with intellectual property rights associated with indigenous people and local communities.

    Comment: This issue is important for NSF, but not for the current COV because of the creation of the Division of Antarctic Sciences.

15. Recommendation: OPP should consider requiring PIs to summarize their track record in "broader impacts," in the section of the proposal describing prior results. In addition, where it would be beneficial, OPP should seek to ensure that the mail or panel reviewers include individuals with strong qualifications to assess and provide feedback on the broader impacts of a proposal.

    Comment: Broader impacts still need to be clarified before this can be done and the vita of a PI may be sufficient as is currently presented.

16. Recommendation: NSF should make final reports from grants available to the public through its Web page. In addition, NSF should study its "core questions for COVs" and determine how to acquire the best information on each question and make this information available for COV use. For example, perhaps each proposal reviewer (mail and panel) should be asked to assess and indicate the innovativeness, riskiness, multidisciplinary of each proposal, and this information could be captured in the statistical data maintained by the agency.

    Comments: These questions are being asked and the data are not collected routinely to respond to the question. NSF needs to decide if they want the questions responded to and if so how will the data be collected.

17. Recommendation: NSF should reduce the number of specific questions it asks of COVs, and emphasize those that are most important to its performance and accountability that are of a type appropriate for COV assessment. In addition,

OPP should identify a few areas in which the COV could provide advice and assessment that would be most important and helpful to OPP's management and outcomes, and pose questions/issues in those areas for the COV consideration, along with the standard NSF direction to COVs.

Comments: We concur completely with the above.

C.5 Please provide comments on any other issues the COV feels are relevant.

Recommendation: PIs should receive all the mail reviews and have the opportunity to write one-page response in a very short time frame. The written response together with the mail reviews would be available for panel review. This type of process is used in Australia successfully and actually reduces administrative time because problems and issues are clarified in advance. We suggest that a pilot project be started at NSF.

Recommendation: A pilot program to test the feasibility of an Antarctic Science pre-proposal process for brief science and logistical review prior to a full proposal and full review that is then negated because the logistics are not available. The total work-impact on the community and on OPP might be reduced by implementing a pre-proposal process. A pre-proposal would be no more than a one or two page document identifying the science objective, programmatic context, location, timing and approximate logistical requirements. The Program Officers in consultation with the logistics section would return advice on whether or not to proceed with a full proposal and perhaps with suggestions on more feasible, alternative logistical implementations. The pre-proposal need not be compulsory, but in some situations, it would better inform the PI, the Program Officer, and the logistics section at the outset. A caveat is that careful management and oversight is required to ensure that projects with challenging logistics requirements are not adversely biased early in the review process. In addition, such a process may improve, modify, or assist with logistical planning by seeing where and how scientists want to work in Antarctica.

C.6 NSF would appreciate your comments on how to improve the COV review process, format and report template.

C.6.a Recommend:
The previous COV report and NSF comments are important for the current COV to review. Equally important would be a written three-year update from the NSF program being reviewed that specifically addresses all previous recommendations. This update should be sent to the current COV in advance of the meeting.

C.6.b Recommend:
Reduce the number of specific questions in the COV report template. Allow the COV to provide more general comments in each category.

C.6.c Recommend:
Have all jackets online for the COV review not just the declined proposals.

C.6.d Recommend:
Program staff members were very helpful. Scott Borg was also very helpful, cooperative, and interested in the process. The Program Officers and administrators were very necessary the first day of the process, but should not be in the room during COV discussions and writing period. Office staff could be assigned for that period.

C.6.e Recommend:
More lead time notifying and setting up the COV and provide all data for review online, with all acronyms defined.

C.6.f Recommend:
A three-day COV would be very useful to allow NSF administrators to clearly set out the goals and objectives of the section or division, allow each Program Officer sufficient time to clearly articulate their programmatic goals and accomplishments as well as discussing the methods they use in decision making, what criteria are used that are tied to goals and objectives of the program, section, division and NSF in general, and what activities they use to involve the community in program development. Such presentations are particularly important given the flexibility afforded to Program Officers for making funding decisions.

SIGNATURE BLOCK:

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For the Office of Polar Program, Antarctic Science Section COV
Margaret N. Rees, Chair