

**NSF Office of Advanced Cyberinfrastructure (OAC)
Committee of Visitors
November 2017**

**OAC Management Response
June 18, 2018**

Introduction

The Office of Advanced Cyberinfrastructure (OAC) in the Directorate for Computer & Information Science & Engineering (CISE) at the National Science Foundation (NSF) held a Committee of Visitors (COV) meeting on November 28-30, 2017. NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert judgments in two broad criteria: (1) assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions; and (2) review of portfolio balance. As stated in NSF's revised guidance, *"COVs should not be used for outcome assessment and evaluation of the outcomes or long-term impacts of program investments."*¹ The four-year scope of the study was Fiscal Years 2013-2016, and the COV was charged to consider the performance of the office in three primary areas:

- Assess the integrity, efficacy, and quality of the processes used to review, recommend, and document proposal actions;
- Assess the quality of project management, monitoring, and evaluation of funded proposals; and
- Comment on the Office's balance, priorities, and strategies for realizing the potential of the Office, and any other issues you think are relevant to quality and integrity of the merit review process, including technical and managerial matters pertaining to proposal recommendations.

The COV followed the report template but framed its recommendations and guidance according to these three areas, as stated in the charter. OAC management has retained this structure in our responses and has also provided a crosswalk to the more detailed sections of the report template.

Prior to initiating planning for the COV, both the Office Director and Deputy Office Director attended COV training to ensure compliance with Conflict of Interest (COI) policies, COV membership, use of the COV module in eJacket, and general guidance concerning preparation for the review. We established a web-based portal containing numerous background documents as well as guidance on relevant NSF policies and procedures. Other background materials include a description of the merit review process, a description of the technical architecture that supports the merit review and award management processes, and a discussion of NSF administrative data.

Webinars were organized before the on-site meeting (i) to familiarize COV members with the materials, with the COV module in eJacket, and with the award management system itself and (ii) to resolve any outstanding COI concerns. As a result of this COI refresher, one panelist withdrew, and a substitute panelist was identified. During the COV meeting, the COV heard presentations from the OAC Office Director and Program Directors for each of the program areas in the office: Networking and Cybersecurity, Data, Software,

¹ Policies, Procedures, Roles and Responsibilities for Committee of Visitors Reviews and Program Portfolio Reviews, revised 09-20-2016, p. 1.

High Performance Computing, Learning and Workforce Development, and a new office-wide program area, Cyberinfrastructure for Emerging Science and Engineering Research (CESER)², which is led by the OAC Science Advisor. This position had been created in response to a recommendation from the 2011 COV.

Finally, OAC notes that there had been a realignment of the Office within NSF since the last COV in 2011. In FY 2013, the reporting structure for the unit within NSF responsible for coordinating research cyberinfrastructure across the Foundation was realigned from the Office of Cyberinfrastructure (OCI) to the Division of Advanced Cyberinfrastructure (ACI) within the Directorate for Computer and Information Science and Engineering (CISE). In FY 2016, this realignment was evaluated, as planned. As a consequence of that nearly year-long internal study, which solicited external comment and undertook detailed analyses of the portfolio, ACI was left in CISE for purposes of management and administration but was renamed “Office of Advanced Cyberinfrastructure” (OAC) in recognition of its broad foundation-wide role. The Office Director participates in NSF Assistant Director level deliberations. This transition was explained to the COV as part of the background and context. The materials that had been developed to support the realignment evaluation in 2016 were also provided to the COV panel.

On June 6, 2018, the COV reported its findings and recommendations to the Advisory Committee for Cyberinfrastructure (ACCI), which accepted the report. The COV panel representative complimented OAC on the thoroughness of the preparation and backgrounders, including the in-person briefings as well as the website:

I wanted to say thank you very much to the organizers of the review. Having served on many NSF panels, the caliber of the materials we received was high. My colleagues on the panel were stellar. The interaction we had was very positive. I would rate this particular meeting highly. It's one of the top I have been involved in. I think most of us felt the same (Deborah Frincke, June 6, 2018).

OAC Management is extremely grateful to the Chair and all the members of the COV for their willingness to serve NSF and for the commitment and enthusiasm they brought to their duties.

I: **Assess the integrity, efficacy, and quality of the processes used to review, recommend, and document proposal actions**

Quality and Effectiveness of the Merit Review Process

We are pleased that the COV finds the merit review process in OAC generally works well. The committee noted that the review analyses (provided in the sample) were “thorough, thoughtful, and complete” and in general, “a good mix of reviewers with appropriate technical expertise were chosen” although the members did note that “it would be useful to have a better sense of the breadth of reviewers (e.g. with respect to institution) in order to better gauge the integrity and quality of the process.” OAC is also pleased that the panel concluded, “In cases where the decision varies from the panel summaries, the Program Director (PD) provided good analyses for the final decision.” Even in situations in which there was a substantial divergence in reviewer ratings, “the PD provided a good explanation/analysis for the variance that provided a fuller context for the final decision.” In addition, the COV “commends the PDs for exercising due diligence and extra effort in several cases to obtain clarifying information from PIs when necessary in making a decision.” The panel expressed concern about confusion in terms used to rate proposals, which vary across programs; about some variation in the emphasis placed on evaluating different aspects of the proposals (e.g., the budget); and about balance in the composition of the review panels,

² https://nsf.gov/funding/pgm_summ.jsp?pims_id=505385&org=OAC&from=home.

observing, however, that perceived preponderance of male reviewers in some – but not all – panels “did not seem to have an adverse effect on overall proposal outcomes.”

COV Finding. The overall integrity, efficacy, and quality of the processes was excellent. In general, there was thorough documentation of all proposals with clear justification for the award decisions made.

COV Recommendation. Continue to maintain the high standards within the office and work to provide more consistency among the various program elements.

Management Response. As noted previously, we are pleased that the COV finds that the overall integrity of the merit review process is “excellent” and that the diligence of OAC Program Directors in adhering to the principles of the merit review process has been acknowledged. We agree that it is important to ensure consistency in the evaluation of various program elements and agree that harmonizing rating systems (competitive v. responsive) is important. However, we note that there is substantial heterogeneity in the size, content, scale, and scope of OAC’s proposal and award portfolio, which may result in some variation in the emphasis that may be placed on some features of the review process. Such prioritization can be addressed in the Review Analyses, which the COV notes are generally thoughtful, thorough, and complete.

COV Finding. In many jackets, the PD included a robust discussion of broader impact. The COV did note however that the quality of the broader impact discussion varied considerably – far more than the quality of the intellectual merit discussion. The COV also noted that in the discussions, the broader impact criteria appeared to be significantly secondary to the intellectual merit criteria – that is, broader impact might be used to distinguish among proposals having similar intellectual merit.³

Recommendation. The COV believes it would be worthwhile to develop strategies to leverage the Office’s track record in successful achievement of the broader impacts as part of the assessment in the review process, whether that track record is recorded qualitatively or quantitatively.

Management Response. We agree that attention to broader impacts (and the related issues of broadening participation) are important to developing a robust research enterprise and the advanced cyberinfrastructure that supports it and are pleased that the OAC Program Directors address the issues in their Review Analyses. We also agree that panel discussion and summaries should address broader impacts fully, including plans for monitoring and assessment, as appropriate to the proposed work and consistent with guidance from the National Science Board (NSB). Panel briefings reiterate the guidance; however, this message can be reinforced during the panel and the approval of the summaries.

Selection of Reviewers

The COV did not formulate a specific recommendation concerning selection of reviewers but did express concern about possible issues of balance, noting that this is a challenge in the technical fields in general. The availability of demographic data, which might illuminate relevant issues, was discussed with OAC management during the review and was raised again as a challenge for the community in the report out.

Management Response. We appreciate the COV’s concern for balance in the composition of review panels, noting that the panel did not discern adverse effects in potential imbalances in the patterns of awards. Moreover, the proportion of new Principal Investigators has consistently risen, suggesting

³ We note that issues of inclusion and balance are also subsumed under the discussion of the portfolio.

that barriers to participation are not increasing despite proposal pressure. Given concerns over confidentiality of the merit review process as well as limitations in the self-reported reviewer data, the current COV report template does not pose questions that presume the COV has access to reviewer demographic data. COV members may examine the membership of review panels for individual jackets and were encouraged to do so. Additionally, NSF does release a list of all reviewers who have served in panels across the foundation on an annual basis. Within these parameters, however, OAC management will continue to monitor participation in panels as well as funded workshops, conferences, and other activities for alignment with NSF's principles concerning broader impact and participation.

II. Assess the quality of project management, monitoring, and evaluation of funded proposals

Management of the Program under Review

We are pleased that the COV has concluded that “the program’s responsiveness to emerging research and education opportunities is excellent” and has identified the various strategies employed to remain current with developments in their fields, receive internal and external inputs, and manage, monitor, and evaluate awards. We agree that the position of “Science Advisor also plays another important role for OAC to learn about new strategic directions and opportunities for Cyberinfrastructure.” We are also pleased that the COV has acknowledged the importance of annual reports and site visits and, as advised, will continue to use these “judiciously.”

Finding. The overall management of the program appears to be excellent. The entire office is highly responsive to the rapidly changing environment and appears to make diligent efforts to both learn what the community needs are, and to plan and prioritize the activities within OAC to address those needs.

Recommendation. COV recommends that OAC (in its leadership role within cyberinfrastructure) investigate the use of more automated tools for monitoring program management.

Management Response. We agree that use of automated tools may facilitate award and program management as well as reduce burden on Program Directors. There are a number of such tools in use throughout the foundation and we will encourage OAC Program Directors to employ them as appropriate.

Finding. The COV noted that dwell time appears to be improving, although it is still a concern.

Recommendation. We encourage OAC to do a fuller analysis to identify process bottlenecks and potential areas to modernize processes through automation and data sciences.

Management Response. We agree that continued attention to dwell time is important and that systematic analysis may expose bottlenecks and opportunities. We note that the range in dwell times varies across programs, and some programs, notably Data Infrastructure Building Blocks (DIBBs)⁴, consistently meet or exceed the Government Performance and Results Act (GPRA) guideline. Moreover, the relatively high incidence of co-funding as well as the extensive and lengthy reviews required for large awards and cooperative agreements can skew the metric at the office level. Extensive collaboration in award decisions, which are conducted through Foundation-wide working groups, may prolong the decision-making process but enables broad support for cyberinfrastructure

⁴ <https://www.nsf.gov/pubs/2017/nsf17500/nsf17500.htm>

across the domain sciences. We are pleased that dwell times are improving and will continue to explore ways to streamline the processes without sacrificing the benefits of collaboration.

Resulting Portfolio of Awards

We note that the COV did not make any explicit findings or recommendations concerning the portfolio of awards. However, in each criterion, the Committee found that OAC's performance was appropriate (pp. 17-21). We are pleased that the COV found that the balance of new awards to new and early-career investigators seemed appropriate and that the portfolio included appropriate discussion of broader impacts. Moreover, concerns about participation of under-represented groups were acknowledged to be "within the pipeline and not how the proposals are handled once received." The program is considered highly relevant to national priorities, agency mission, relevant fields, and other constituent needs," and in general, the committee concluded, "This is a high-quality program supporting critical scientific discovery, and likewise increasing access to the CI required to perform high-end scientific discovery in many areas."

III. Comment on the Office's balance, priorities, and strategies for realizing the potential of the Office, and any other issues you think are relevant to quality and integrity of the merit review process, including technical and managerial matters pertaining to proposal recommendations

OAC is grateful for the COV's broad consideration of issues the office faces and appreciates the suggestions for ways to enhance the programs. We note that the Committee, again, has commended OAC management and program officers for its management of the merit review process despite the workload and the "large number of variables to deal with in the review process." Overall, "the COV was impressed with the great level of attention and detail that the Office has given to the large number of proposals that they must review."

Finding. COV was impressed with the great level of attention and detail that the Office has given to the large number of proposals that they must review. We commend OAC for seeking to ensure consistency in the review process despite having a large number of variables to deal with in the review process. Some suggestions for achieving greater consistency include:

Recommendation. OAC should consider including a sustainability plan for software and tools as a criterion in the review process in all programs where it is applicable. In addition, OAC might consider requiring certain awards to have a report with a discussion of community acceptance of the software for renewals.

Management response. We agree that sustainability is an important concern across OAC's programs and will consider different mechanisms for addressing this issue as appropriate to individual solicitations. Sustainability plans are currently addressed in the Software Infrastructure for Sustained Innovation (SI²)⁵ program, and data management plans, which address both data and software, are a required element of all NSF proposals. However, we agree that these are initial steps and exploration of further mechanisms should be considered.

Recommendation. OAC should have a well-defined process and a clear understanding of the research and industry landscape in the development of DCL[s] and solicitations. This clear understanding is critical to the mission of OAC.

⁵ <https://www.nsf.gov/pubs/2016/nsf16532/nsf16532.htm>

Management response. We agree that understanding the research and industry landscape is critical to the mission of OAC. Such relationships are also under exploration by other units in CISE as well as elsewhere in the foundation. We will work with colleagues to continue to deepen our understanding of these opportunities to build partnerships. We note, as well, that inter-agency partnerships (e.g., through the National Strategic Computing Initiative) are equally important to the OAC mission and to the efficient allocation of limited federal resources and will continue to explore opportunities for building synergies across Government.

Recommendation: OAC should consider automation/deep learning + science as a theme meriting prioritization across the portfolio. In addition, it would be helpful if future annual reports include a discussion of the potentially transformational implications of deep learning on the conduct of science.

Management response. OAC agrees that automation/deep learning + science is an important theme and resonates with current Administration priorities in AI as well as the Big Ideas, which have been put forth by the NSF Director. As the COV acknowledged, OAC receives input from many sources in establishing programmatic priorities and agrees that although the annual reports follow a prescribed format, discussion of broad themes and priorities should be a component of them.

IV. Requests advice on progress concerning issues raised by the previous (2011) COV during the last four years, recognizing the change in administrative structure that took place in 2013 and the reassessment in 2016

OAC is pleased that the COV reviewed progress since the last COV (2011) and found that the office has been attentive to the concerns raised by that review, which included recommendations with regard to the dwell time for some of the larger grants, the size and duration of the DataNet⁶ awards, the tracking of outcomes of the Taskforce reports from 2009, the skill sets required for the management of the large-scale programs, and the turnover in some of the program staff. The COV has offered additional observations and comments, based on the continued rapid changes in technologies and offerings.

Finding. In each case, OAC provided an appropriate and thoughtful response to the prior COV's findings and recommendations.

Recommendation. As many of the findings reflect the rapidly changing environment (both technically and fiscally) and, in some cases, longer-term projects, the COV encourages the Office to continue to closely monitor and address the issues highlighted in earlier reports. The COV also noted that dwell time continues to be a concern and OAC should continue to closely monitor this issue.

Management response. We agree that the research environment is changing rapidly as a result of evolution in the technology, new commercial services and vendors, internal changes in higher education and advanced research under demographic and financial stress. However, we also continue to see extraordinary creativity and opportunities to evolve new models for provisioning the research cyberinfrastructure through strategic investment. As advised by the COV, we will continue to seek opportunities for input from a broad range of stakeholders while maintaining the current high standard for merit review and proposal and award management. In addition, ongoing communication with the research advanced cyberinfrastructure community will be an important feature in future planning activities, and we will seek opportunities to reach out to new and existing communities.

⁶ Sustainable Digital Data Preservation and Access Network Partners (DataNet), <https://www.nsf.gov/pubs/2007/nsf07601/nsf07601.htm>. This program was replaced by DIBBs.