

Recommendations

A compilation of the COV recommendations is provided below, listed in the order of appearance in the report.

Recommendation 1. AST should explore additional avenues to identify potential reviewers, in order to lighten the burden on AST staff of recruiting panelists, while simultaneously ensuring a reviewer pool that is as diverse as possible (with respect to both scientific and educational expertise, institution type, career stage, and demographics).

AST continues to improve its reviewer recruitment processes, with the goals of expanding and diversifying the reviewer pool. For example, AST has established a web link that allows scientists to sign up to volunteer to be reviewers and mentions the opportunity and importance of this activity at all conference NSF town halls and other venues as appropriate. We also allow, for most review panels, the PIs to choose to participate either in person or remotely. AST staff will continue to explore new ways to identify and recruit potential reviewers, including the specific avenues suggested by the COV in its full report.

Recommendation 2. Strengthen the pre-meeting briefing to improve the quality of reviews by emphasizing the importance of NSF's several Merit criteria; provide examples of specific evaluative language; and encourage critical and thoughtful consideration of Broader Impacts.

AST appreciates the COV's recognition of the importance of pre-meeting briefings, which were instituted during the COV review period to instruct reviewers about the merit review process before they start writing their reviews. AST will review its standard pre-meeting briefing slides and will add language and/or emphasis that specifically addresses the COV recommendations.

Recommendation 3. For individual reviews, AST should establish a deadline of ~7 days prior to the panel meeting for panelists to deliver their evaluations.

AST recognizes the need to use all reasonable methods to attempt to improve the quality of the submitted reviews. Division staff have begun an internal discussion about setting earlier deadlines, and we are developing guidelines for Program Officers to use when providing feedback to reviewers about their submitted reviews. AST will test earlier deadlines for some panels right away, evaluate the impacts, and consider adopting this as standard practice.

Recommendation 4. AST should undertake a trade study to explore the potential positive impact of double-blind (anonymous) reviews for AAG, ATI, AAPF and CAREER.

AST is paying close attention to the outcomes from the double-anonymous review processes currently being developed for observing programs at NASA and some NSF-funded facilities. We will also begin a discussion of this recommendation more broadly at NSF, as the dual-criterion merit review follows an agency-wide process that requires reviewers to assess the qualifications of the proposal team and of the resources available to the PI.

Recommendation 5. The current pre-panel briefing, which initiates participants to the review process, should highlight the critical nature of the panel summary, and outline clear expectations for its contents.

AST provides instructions to the panelists for the panel summary, and a template for the summary during the panel introduction, on the first day of the panel. We have found that the first day of the panel is the most appropriate time to discuss the panel summary with the reviewers, rather than during the pre-panel briefing, which takes place several weeks before the panel. We will improve this presentation by more strongly emphasizing the expectations for the panel summary. We will compare approaches used by various program officers and adopt those that are most successful at encouraging panels to write effective summaries.

Recommendation 6. Panelists should be instructed to focus their efforts to bin proposals into categories of **Highly Competitive**, **Competitive**, and **Not Competitive**; and divert attention, previously paid to detailed order ranking, toward writing thoughtful, constructive panel summaries.

The detailed discussion that arises when panelists provide rank order often provides a critical part of the overall assessment, since that is the only time when proposals are directly compared. Discussion of the rankings improves panel summaries, since they allow additional focus on the proposals and their strengths and weaknesses. AST Program Officers have the flexibility to choose to bin proposals into the recommended categories without rankings, and they already have the authority to make award recommendations that do not strictly follow the panel rankings. (See also response to Recommendation 8b)

Priority Recommendation 7. We recommend that AST implement a more rigorous approach to Broader Impacts in all aspects of the review process.

We recommend the following specific actions:

(a) AST should utilize the pre-panel briefing to set expectations for reviewers to consider the Broader Impacts criterion with similar rigor as for Intellectual Merit.

AST recognizes the importance of pre-panel briefings in helping to ensure high quality reviews. AST will use these briefings to emphasize the importance of Broader Impacts, instruct reviewers on how to properly evaluate Broader Impacts, and define the expectations regarding Broader Impact review.

(b) AST should take steps to ensure that review panels have appropriate scholarly expertise associated with evaluating Broader Impact scopes of work. This might require different recruitment sources, and accepting panel members with expertise in Broader Impacts, but less so with the principal scientific themes.

Within the constraints of filling sufficiently diverse and knowledgeable review panels, AST will explicitly recruit reviewers who have expertise in various aspects of Broader Impacts, acquired either through formal training or through experience. We will continue to monitor the process and will continue to seek additional “ad hoc” reviews whenever appropriate.

(c) AST Program Officers should reinforce the commitment to high-quality Broader Impact reviews in their proposal funding recommendations.

AST will carry out internal exercises to ensure that all Program Officers have an understanding of and commitment to NSF’s policies regarding the Broader Impact criterion. We will also plan external exercises to better educate the community. Division management will ensure that Broader Impacts are sufficiently weighted in review analyses before they are approved.

Priority Recommendation 8. To address NSF’s strategic goals for the future, we urge that AST take a leadership role toward developing a STEM workforce that reflects the rapidly changing demographics of the United States.

We recommend the following specific actions:

(a) Program Officers should reinforce the commitment to diversify the astronomy workforce by increasing equity for underrepresented groups in the awards portfolios.

AST will begin a series on internal discussions to explore our role in developing the STEM workforce, to further evaluate our current processes and portfolio, and to identify steps we can take to increase equity for underrepresented groups.

(b) To allow POs appropriate flexibility to exercise that role, reviewers should be asked to categorize proposals as “**Highly Competitive**”, “**Competitive**” and “**Not Competitive**,” in lieu of a detailed numerical ranking. (Recommendation 6, §4.7.)

NSF allows Program Officers sufficient flexibility and judgment to develop award portfolios that increase equity and to counteract any real or perceived biases. With justification, POs are able to make award recommendations that advance equity and other concerns, without adhering strictly to the panel rankings. (See also response to Recommendation 6)

Recommendation 9. NSF should explore competing major new Gemini instruments through MSIP, while maintaining a smaller internal fund for instrument upgrades.

The Gemini Instrument Development Fund (IDF) is established by agreement with the Gemini partners as described in the Gemini International Agreement. Target funding levels are reviewed, discussed, and set annually by the Gemini partners. Since 2015 the international partners (the U.S., Canada, Brazil, Argentina, and the Republic of Korea) have all contributed to the IDF at the agreed upon level of 10% of their individual operations and maintenance (O&M) commitments. At the same time, Gemini welcomes Visiting Instruments to provide additional

capabilities. These Visiting Instruments are sometimes funded through the NSF grants programs. Shifting funding of major Gemini instruments to the NSF MSIP program while reducing the contribution to the IDF would not only require a change in the Gemini International Agreement, but would reduce or eliminate IDF contributions by the Observatory's international partners.

Recommendation 10. AST should raise the profile of the ESM office and related NSF programs in the astronomical community, enabling a better flow of relevant information and transfer of knowledge.

To raise the profile of the Electromagnetic Spectrum Management office (ESM) and related NSF programs in the astronomical community, the ESM office will begin contributing regularly to the NSF booth at AAS meetings and provide informational highlights to the NSF townhall meeting. The ESM office will consider further ways to implement this recommendation by participating in selected other meetings where there would be opportunities to communicate with the astronomical community directly. Another place where relevant information and knowledge can be readily shared is via NSF facilities utilizing or impacted by electromagnetic spectrum emissions. To enable a better flow of information to these facilities, the ESM office will discuss with the cognizant NSF program officers to find the most effective way to communicate to facilities and their astronomical users.

Recommendation 11. Rapidly recruiting additional AST POs and replacements for key AST staff must be a high priority for NSF.

As part of the Federal Government, NSF follows Federal guidelines and regulations that apply to the recruitment and replacement of staff. Typically, the recruitment and replacement process of AST staff proceeds at the maximum pace allowed by Federal guidelines and regulations and internal NSF processes.

Recommendation 12. AST develop and implement plans to achieve a more representative Program Officer and Division leadership.

(See answer to Recommendation 11) As part of the Federal Government, NSF follows Federal guidelines and regulations that apply to the recruitment and replacement of staff as well as NSF internal policies and procedures. All AST job openings, including limited term and permanent staff positions, are broadly announced within the community. The recruitment of Division leadership follows the same guidelines, regulations, and policies. NSF and AST will continue to follow federal equal opportunity laws in the recruitment of new staff members.

Recommendation 13: AST formally designate interagency liaisons for NASA and DOE.

NSF/AST interacts on many levels with various divisions at NASA and DOE, and many program officers are involved in specialized aspects with their counterparts at other agencies. Given the specialized interactions needed for individual collaborative NASA and DOE programs and

projects combined with current staffing limitations, it is not practical to designate a single liaison for NASA and DOE. For example, the interactions between NSF/AST and the NASA Planetary Sciences Division are fundamentally different from the formal partnership on LSST between NSF and DOE. Nevertheless, the COV correctly points out that some of the current channels of communication are informal, particularly between NSF/AST and NASA/APD. The "umbrella" MOU for NASA-NSF interagency activities is no longer in force. Instead, we are drafting a new series of MOUs to put our coordinated activities on a more formal basis. Through twice-a-year meetings and interim working groups, we will continue raising the level of cooperation between NSF/AST and NASA/APD and ensure that is less dependent on current individuals.

Recommendation 14. AST, with Astronomy Community input, develop Division metrics according to Intellectual Merit and Broader Impact for use by future COVs, and others.

AST has begun internal conversations on this recommendation. We recognize that our overall mission to "promote the progress of science" is a difficult thing to measure. We will engage other disciplines across the foundation to explore the development and use of such metrics within the overall NSF Merit Review context. We will also develop an appropriate process for community input.

Recommendation 15. AST should preserve its expertise in the divestment process, including compliance with governing laws, and maintain interfaces with the key Offices within NSF.

AST agrees and is planning accordingly. AST expertise in the divestment process achieved in the current decade will without doubt be needed in the next decade as new facilities recommended by the Astro2020 Decadal Survey are built and transitions are achieved for older facilities.