

The Astrophysics Division Inclusion Plan Pilot Program

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Executive Summary

In support of the National Aeronautics and Space Administration's (NASA) Agency-wide core value of Inclusion, as well as the Science Mission Directorate's (SMD) objective of increasing the diversity of thought and backgrounds represented across the portfolio, the Astrophysics Division undertook an Inclusion Plan Pilot Program (Pilot Program). The goal of the Pilot Program was to determine if SMD could assess whether proposed Research and Analysis (R&A) investigations would further inclusion and whether such assessments could be factored into future selection decisions. The Pilot Program was conducted as part of ROSES-2021 program element D.4 Astrophysics Theory Program, which supports efforts to develop basic theory across an extremely wide range of astrophysical topics. All proposers were asked to include an anonymized Inclusion Plan of up to two pages in length, addressing: (i) plans for creating and sustaining a positive and inclusive working environment, and (ii) contributions the proposed investigation will make to the training and development of a diverse and inclusive scientific workforce. These plans were then assessed both by the science panels, as well as specialized panels, which were made up of a combination of experts in promoting inclusion in the sciences and astronomers involved in inclusion, diversity, equity, and accessibility work.

Based on detailed feedback from the specialized panels, the science panels, and the proposers, several key results were drawn from the Pilot Program. The most important of these is the overwhelming support for the continued and expanded use of Inclusion Plans, with the overall goal of establishing standards that should be met by all SMD-supported R&A investigations. The Pilot Program also identified several concrete ways to refine future solicitations and their assessment by panel review, so that Inclusion Plans can be developed and evaluated most effectively. Finally, the Pilot Program demonstrated the need for common resources and training to assist assist Principal Investigators (PIs) and NASA Program Officers in best achieving the inclusion goals of selected investigations. These results are closely aligned with the recommendations of the National Academy of Sciences Decadal Survey on Astronomy and Astrophysics, *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*, which were released shortly after the Pilot Program was completed.

Background

On July 23, 2020, NASA Administrator Jim Bridenstine announced that the Agency had added Inclusion to its set of core values, complementing the existing values of Teamwork, Safety, Integrity, and Excellence. In describing this value, NASA reiterated that *it is committed to a culture of diversity, inclusion, and equity, where all employees feel welcome, respected, and engaged. To achieve the greatest mission success, NASA embraces hiring, developing, and*

*growing a diverse and inclusive workforce in a positive and safe work environment where individuals can be authentic. This value will enable NASA to attract the best talent, grow the capabilities of the entire workforce, and empower everyone to fully contribute.*¹

This core agency value is also closely related to the Science Mission Directorate (SMD) core value of Inclusion, and SMD Strategy 4.1, to *Increase the diversity of thought and backgrounds represented across the entire SMD portfolio through a more inclusive and accessible environment.*²

In support of these agency-wide and SMD-specific values, the Astrophysics Division undertook an Inclusion Plan Pilot Program to determine if the Division could assess whether proposed Research and Analysis (R&A) investigations would be likely to further NASA's inclusion goals, and whether such assessments could be factored into future programmatic decisions.

Methods

The Pilot Program was conducted as part of the Research Opportunities in Space and Earth Science 2021 (ROSES-2021) program element D.4 Astrophysics Theory Program (NNH21ZDA001N-ATP), which supports efforts to develop the basic theory for NASA's space astrophysics programs. The Astrophysics Theory Program (ATP) solicits investigations that consist predominantly of theoretical astrophysics studies or the development of theoretical astrophysics models, and that facilitate the interpretation of data from space astrophysics missions or lead to predictions that can be tested with space astrophysics observations. The ATP Program spans a wide range of astrophysical topics, making it well-suited to a Pilot Program that draws information from the breadth of the astrophysics community. Furthermore, the ATP Program was conducted under the dual-anonymous peer review process, allowing the exploration of how well inclusion efforts could be assessed within the constraints of an anonymized evaluation.

In addition, the ATP program officer, Evan Scannapieco, was the Chair of the Astrophysics Division R&A Inclusion, Diversity, Equity, and Accessibility (IDEA) Task Force that was tasked with establishing the Pilot Program along with a number of related IDEA efforts within the Division. The other members of this task force were Dominic Benford, Valerie Connaughton, Paul Hertz, Hashima Hasan, Stefan Immler, Hannah Jang-Condell, Patricia Knezek, William Latter, Kartik Sheth, and Eric Tollestrup, all of whom contributed to the development of the solicitation language and evaluation criteria.

For the Pilot Program, all proposers were asked to include an anonymized Inclusion Plan of up to two pages in length, addressing:

- Plans for creating and sustaining a positive and inclusive working environment for those carrying out the proposed investigation, and
- Contributions the proposed investigation will make to the training and development of a diverse and inclusive scientific workforce.

¹ <http://www.spaceref.com/news/viewsr.html?pid=53907>

² https://science.nasa.gov/science-red/s3fs-public/atoms/files/2020-2024_Science.pdf

The Inclusion Plan was then evaluated according to the following factors:

- Does the Inclusion Plan adequately communicate the goal of a positive and inclusive working environment for the investigation team? Does the Inclusion Plan provide adequate processes for creating and sustaining a positive and inclusive working environment for the investigation team? Are these processes likely to be successful in achieving the goal?
- Does the Inclusion Plan adequately describe the contribution of the proposed investigation to the training and development of a diverse and inclusive workforce? Does the Inclusion Plan provide an adequate plan for achieving the identified contribution? Is the plan likely to be successful in realizing the identified contribution?

These criteria were intentionally written in a general way for the Pilot Program in order to learn what the community currently considers good inclusion practice and to avoid being prescriptive in a way that could possibly lead to a check-the-box response or an example that could be parroted back to NASA. For the Pilot Program, the assessment of the Inclusion Plan was not factored into the adjectival grade for the proposal and did not affect whether or not the proposal was selected for funding.

The Inclusion Plan Pilot was approved by SMD leadership through the consensus process on March 10, 2021, and the ATP ROSES program element was amended to include the plan on March 25. On April 24, the Astrophysics Division conducted an information session during which ATP Program Officer Evan Scannapieco and ATP Deputy Program Officer Kartik Sheth described the Inclusion Plan Pilot in detail and answered questions from the community. A frequently asked questions (FAQ) document was also maintained by the division, which linked to useful documents on inclusion, including NASA's webpage of resources on Diversity and Inclusion,³ the final report of the American Astronomical Society (AAS) Task Force on Diversity and Inclusion in Astronomy Graduate Education,⁴ and the report from the American Institute of Physics (AIP) National Task Force to Elevate African American Representation in Undergraduate Physics & Astronomy (TEAM-UP) Project.⁵

The ATP solicitation closed on July 1, 2021 and 182 proposals were submitted to NASA. The proposals were then evaluated by 20 science panels, which considered approximately 9-10 proposals each, evaluating both the standard ROSES proposal elements, to inform selection decisions, and the anonymized Inclusion Plans, to provide feedback to the proposers. In addition, 120 Inclusion Plans were randomly selected for review by specialized inclusion panels, which were made up of a combination of experts in promoting inclusion in the sciences and astronomers involved in IDEA work. These panels considered only the anonymized Inclusion Plans, providing their own feedback to the proposers. All panels were conducted virtually, due to the COVID-19 pandemic, and the ATP Deputy Program Officer during and subsequent to the review was Sanaz Vahidinia. The NASA monitors for the specialized inclusion panels were Astrophysics Division R&A IDEA Task Force members Valerie Connaughton and Hannah Jang-Condell, as well as Nicolle Zellner from the Planetary Science Division, and Ryan Watkins from

³ nasa.gov/offices/odeo/diversity-and-inclusion

⁴ baas.aas.org/pub/2019i0101/release/1

⁵ www.aip.org/diversity-initiatives/team-up-task-force

the Exploration Science Strategy and Integration Office, who is now leading a similar Pilot Program as part of ROSES-2021 element F.10 Payloads and Research Investigations on the Surface of the Moon (NNH21ZDA001N-PRISM).

Each of the science panels was asked to provide verbal feedback on the Pilot Program as part of the panel debrief, and feedback was also solicited from the proposers as part of the letters that accompanied the selections decisions, which were announced on November 5. Finally, although they were only required to provide verbal feedback on the Pilot Program, each of the specialized inclusion panels voluntarily produced a written document of detailed recommendations. Our results and lessons learned draw heavily from these recommendations and feedback from the science panels and proposers.

Results and Lessons Learned Summary

The key results and lessons learned from the Pilot Program are:

- Recommendation: SMD should add an Inclusion Plan requirement more broadly to ROSES elements.
- Lesson: The Pilot Program has established several concrete ways to refine such future solicitations and their assessment by panel review.
- Recommendation: Inclusion Plans should influence selection decisions at the boundary, and a plan that does not meet minimal standards should be sufficient justification for the non-selection of any proposal.
- Recommendation: SMD should establish common resources and training to support Divisions and Program Officers that require Inclusion Plans.

Results and Lessons Discussion

Below we discuss each of the key results in more detail, grouping them into eight major lessons learned:

1. The most important lesson learned from the Pilot Program is the overwhelming support for the continued and expanded use of Inclusion Plans.

While a small fraction (5-10%) of the science panelists were not in favor of using plans in future solicitations, the effort was strongly supported by the vast majority of the science panelists, who represented an extremely broad range of fields, institutions, and demographic groups. In addition, all four specialized panels wholeheartedly endorsed the effort, with inclusion panel 1 (IP1) stating that “Our goal should be to redefine scientific excellence,” IP2 strongly urging NASA to “continue this and related processes,” IP3 stating that NASA should adopt “[removing] barriers to equity and inclusion for this project as a key adjudicated metric,” and IP4 unanimously agreeing that “plans for inclusion can and should be incorporated as a selection criterion.”

On, November 4, one day before the ATP results were released, the National Academy of Sciences released the results of the 2020 Decadal Survey on Astronomy and Astrophysics, *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*, which included a

recommendation that “NASA, DOE, and NSF should consider including diversity—of project teams and participants—in the evaluation of funding awards to individual investigators, project and mission teams, and third-party organizations that manage facilities. Approaches would be agency-specific and appropriate to the scale of the projects.” As protected classes are not allowed to be factored into selection decisions by NASA, we interpret the Inclusion Plan Pilot Program efforts as an appropriate NASA response to this recommendation.

2. The most reliable way to assess Inclusion Plans is by having them reviewed by specialized panels made up of a combination of IDEA experts in the sciences and subject matter experts.

While many of the science panels did a good job at assessing the Inclusion Plans, this was not uniformly the case. Instead, the inclusion reviews from science panels varied in quality, resulting in findings that would not always be defensible if they had been used to inform selection decisions.

The Astrophysics Division worked with two IDEA experts, Timothy Sacco & Dara Norman, who used NVivo qualitative analysis software to compare a carefully-chosen set of 32 reviews from science and inclusion panels.⁶ They found that while science panels often matched the overall sentiment of expert reviewers on the inclusion panels, some important differences existed, including:

- Inclusion panels were more concerned with the concrete details of the plans, the effects of the proposed activities, and the benefits of the activities for the junior researchers they were designed to serve.
- While descriptions of previous participation in IDEA efforts often impressed the science panels, the inclusion panels only counted these as strengths if they were relevant to the planned activities.
- Inclusion panels did a better job interpreting the implications of the language used by the proposers.
- Inclusion panel comments were much more direct and provided less ambiguity.

However, Norman and Sacco also warned against adopting a permanent solution in which the proposers perceive their Inclusion Plans as reviewed by outsiders and in which the inclusion goals are held distinct from the science goals. Thus, if specialized panels are used to evaluate the Inclusion Plans, NASA will need to make it clear that such panels are made up of both IDEA experts and subject matter experts, paralleling the groups of engineers and scientists that are currently convened as part of the evaluation of proposed missions.

3. A good model for including Inclusion Plan findings in future selection decisions may be similar to how NASA Relevance is dealt with in current reviews.

It was clear from the panel review that even if Inclusion Plans were evaluated by science panels, it would be difficult for them to be incorporated into the science and technical merit assessment of the proposals. Rather, inclusion is best framed as its own criterion, similar to Cost

⁶ Sacco & Norman in press

Reasonableness and NASA Relevance. In fact, the second of these criteria provides a model of how inclusion could be effectively integrated into NASA reviews.

Currently, in cases in which a review panel finds a proposal to have no relevance to NASA (for example an ATP proposal concerned only with ground-based astronomy), it is deemed unselectable, even if the science and technical merit is highly-rated. Similarly, if an Inclusion Plan is so poor as to be antithetical to NASA's core values, this could serve as a "veto" to an otherwise selectable proposal. This would be consistent with IP3 recommendation that "If the plan gets a 0, it should be disqualifying," and IP4's recommendation that "the Inclusion Plan must be given sufficient weight to deem the proposal unfundable if minimum criteria are not met."

Another case could be in making selection decisions between a handful of proposals at the boundary of what can be funded during a competitive review. In this case, just as a tighter connection between theory and NASA missions might serve to provide a stronger case for selecting one proposal over another, so too might a proposal with a strong Inclusion Plan be selected over one with a marginal case. Indeed, support of inclusion, a core NASA value, is itself a form of NASA relevance.

4. Inclusion Plan review is compatible with dual-anonymous peer review, and this process may even be preferable to non-anonymous review.

While several of the participants on the April 24 informational call were concerned that Inclusion Plans could not be accurately reviewed in an anonymized way, this turned out not to be the case. All four inclusion panels were offered the ability to see proposer information as part of the review, but none of the panels chose to look at this information. Two of the panels (IP2 and IP3) said it was not needed to review the plans, and two other panels (IP1 and IP4) said that it could only harm the review by introducing bias.

It is also notable the specialized panels were extremely diverse in terms of race, ethnicity, and gender, but still agreed unanimously that the demographics of the proposers and the proposing teams themselves were not needed for the review. This illustrates that the use of Inclusion Plans in no way violates NASA rules that prohibit considering protected classes in selection decisions.

5. The Inclusion Plan Pilot Program was able to identify five key ways in which the Solicitation Language can be improved for future reviews.

5a. While the Pilot Program language was intentionally general, future calls need to be as explicit as possible about the areas in which NASA seeks to make progress.

The Inclusion Plan Pilot Program defined diversity by reiterating language from ROSES section 3.1, namely; "Diversity is defined broadly as the unique characteristics, such as different backgrounds and perspectives, diversity of thought and life experiences, that define us as individuals and shape our workplace. These include, but are not limited to, career stage, disability, ethnicity, institutional background, gender, geography, race, and sexual orientation." This type of general statement allowed teams to focus their plans on areas in which problems are

negligible, such as sustaining a positive and inclusive working environment for both theorists and observers, rather than on areas in which progress is most urgently needed, such as sustaining a positive and inclusive working environment for women and underrepresented minority groups.

Several inclusion panels underscored the importance of focusing this language, stating: “Multiple proposals interpreted the definition of diversity as differences in research focus or career stage, without speaking to other elements of diversity closer in spirit to NASA’s intent” (IP3) and “If NASA wishes to address the persistent lack of diversity and the historical exclusion of women and individuals with gender-expansive identities, racially minoritized populations, persons with disabilities, and other marginalized groups, then the guidance provided to proposers and reviewers on what is meant by diversity and inclusion must explicitly call for these to be addressed” (IP2). For Inclusion Plans to be most impactful, language calling out the particular need to improve the inclusion of proposing teams along axes of “gender, race, ethnicity, geography” such as described in Sec 7c in *the Presidential memorandum on Restoring Trust in Government* will likely be needed.⁷

5b. Future solicitations need to push the team to address the “intentionality” of their work by providing a clear description of barriers specific to the group and what they specifically want to achieve.

Many teams described general good workplace practices, but only weakly tied these to the proposed investigation or to the goals of adopting an inclusive working environment and contributing to the training and development of a diverse and inclusive scientific workforce. Future solicitations should push the team to provide “intentionality, details, [and] actions” (IP1), and encourage “applicants to take a long and hard look at what diversity and inclusion mean to them, and what they are doing to address them in their research groups” (IP2).

By asking the team to provide a clear description of barriers specific to the group and the actions that follow to address them, future solicitations will help the proposers adopt an intentional structure to their inclusions plans, paralleling the scientific motivation described in the science and technical section of the proposal.

5c. Future solicitations need to push the team to define implementable, evidence-based actions, and explain how they will assess their progress.

Just as the motivations for many of the actions described in the plans were often lacking, so too were the descriptions of the desired outcomes and evidence supporting the likelihood of success. Future solicitations can address these issues by clearly stating that plans “must spell out goals, activities to achieve these goals, [and] metrics for measuring how well activities are working” (IP2) and encouraging “PI’s to cite research that supports the use of specific practices” (IP4).

5d. Future solicitations should better distinguish inclusion from outreach activities.

⁷ <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/>

A significant fraction of the proposers interpreted the Inclusion Plan as equivalent to the NSF Broader Impacts requirement and designed outreach activities, rather than actions focused on training and the working environment for the group. Future solicitations should make this difference more explicit and clarify that Inclusion Plans should specifically note measurable outcomes for the team itself.

5e. Future solicitations should be more explicit that funds can be used on activities to boost IDEA, including for assessment and evaluation purposes.

Several of the specialized panels felt that many of the proposers unnecessarily limited their plans so as not to have an impact on the budget. In particular, assessment of results in partnership with local sociology or education research experts could lead to more impactful actions. Future solicitations should clarify the level at which NASA envisions proposers including such activities in their budgets.

6. The Inclusion Plan Pilot Program was able to identify three important issues concerning the manner in which specialized panels can be run most effectively.

While the inclusion panelists uniformly suggested a more rigid process than the usual merit review, they also did an excellent job at evaluating the plans without such a rigid process. Although three out of four specialized panels suggested that a rubric for scoring Inclusion Plans was needed, IP3 warned that. “We should avoid getting so transactional that these become checkboxes,” and NASA should be very wary of adopting a process that stifles creative solutions from the community. While a rubric may be feasible after a few years of implementing these criteria, it may not be desirable or needed. There is no current rubric for excellence in science for instance.

Secondly, Inclusion Panels should consider eliminating chair sign-off of panel review summaries. This is because chair sign-off can skew the summaries towards subject matter experts as, at least currently, this is the group that includes members that are ready to serve as panel chairs.

Thirdly, there is currently a tension between NASA language (e.g., “the proposal did not adequately”) and the language that is most likely to induce a culture shift in the scientific community (e.g., “the proposal could have been strengthened by”). The second form is appropriate for these inclusion panels as it is more likely to further NASA’s core value of inclusion.

7. Accountability is crucial and additional incentives for showing progress in yearly reports may be needed. NASA Program Officers may need additional training.

The Inclusion Plans will only have an impact if they are actually implemented by the funded teams, and assuring this requires oversight. This means that annual progress reports should be required to include updates on Inclusion Plan efforts, and NASA should provide clear guidelines to funded groups on this reporting, along with guidelines and training to Program Officers on

how to evaluate it. Additional positive and negative incentives for showing progress may also be needed for the Inclusion Plans effort to have a significant impact on the community.

8. Links to written resources such as the FAQ provided as part of the Pilot Program were not sufficient, and NASA should consider complementing them with other avenues for training and resources.

As stated succinctly by IP3, “This is a big culture shift that will require a lot of coaching by NASA for DEI plans to improve.” Even with a more specific language in the solicitation, many PIs will still be lost and propose ineffective plans. All four specialized panels suggested that NASA will be able to better progress towards its IDEA goals by complementing the use of Inclusion Plans with increased resources to disseminate what is known about evidenced-based practices to create inclusive workspaces. These could be developed in partnership with professional societies and include workshops, webinars, community conversations, and other connections to resources.

Conclusions

The Inclusion Plan Pilot Program was a significant step towards advancing the IDEA goals of the Agency in general and the Science Mission Directorate in particular, and it places the Astrophysics Division in an excellent position to address a key recommendation of the National Academy of Sciences’ Decadal Survey on Astronomy and Astrophysics. However, the Pilot Program is only a beginning, which was designed to assess the feasibility of Inclusion Plans and the state of what the community currently considers good inclusion practice.

The Pilot Program uncovered overwhelming support for the expanded use of Inclusion Plans with the overall goal of establishing standards that should be met by all SMD-supported R&A investigations. To reach this goal, however, future solicitations will need to be refined to address several key issues, and panel reviews will need to be restructured so as to ensure that Inclusion Plans are evaluated with the same high standards as science and technical merit evaluations. The Pilot Program also identified the need for common resources such as workshops, webinars, and trainings to assist PIs and NASA Program Officers, to help build the expertise needed to realize the goals expressed in the Inclusion Plans. Working closely together with PIs to promote inclusion throughout its sponsored research and analysis projects will be essential to accomplish NASA's goal of attracting the best talent, growing the capabilities of the entire workforce, and empowering everyone to fully contribute.