



8 August 2017

Dr. Paul Hertz
Astrophysics Director
Science Mission Directorate
National Aeronautics and Space Administration (NASA)

Dear Paul,

The NASA Astrophysics Advisory Committee (APAC) met at NASA HQ on July 19, 2017 and the Residence Inn by Marriott Hotel across the street from NASA HQ on July 20, 2017. The following members of the APAC attended most or all of the meeting: Natalie Batalha, Marshall (Mark) Bautz, James (Jamie) J. Bock, Alan Boss, Patricia Boyd, Neil Cornish (via telecom), Brenda Dingus, Debra Fischer, Scott Gaudi (APAC Chair), Jason Kalirai (via telecom), Paul Scowen (via telecom), Yun Wang, and Beth Willman (via telecom). Hashima Hasan (APAC Executive Secretary) was also in attendance. Asantha Cooray and Feryal Ozel (APAC Vice Chair) were unable to attend, although Asantha Cooray was able to call in on the second day to give his presentation on the Origins Space Telescope (OST) Science and Technology Definition Team (STDT) Study.

Dr. Hasan opened the meeting by welcoming the APAC members. She noted that a few APAC members had conflicts of interest with specific topics on the agenda. During those presentations, the conflicted members would remove themselves from the members' table as an indication of their recusal; they would be allowed to listen to the presentation, but they could not participate in the discussion. Dr. Hasan then reviewed the Federal Advisory Committee Act (FACA) rules. Dr. Gaudi added that offline conversations cannot form the basis for APAC recommendations.

The agenda consisted of the following presentations:

- Astrophysics Division Update – Paul Hertz
- Report on FY18 Civil Servant Directed Work – Paul Hertz
- High risk/high Impact Research and Analysis (R&A) Funding – Michael New
- James Webb Space Telescope Update – Eric Smith
- Transiting Exoplanet Survey Satellite Update – George Ricker and Jeff Volosin
- Review of GPRAMA Guidelines – Jennifer Kearns
- Update on Suborbital Science – Michael Garcia, Eric Tollestrup, Stefan Immler, Thomas Hams
- K2 End of Mission Science Planning – Charles Sobeck
- Neutron star Interior Composition ExploreR (NICER) Mission Update – Keith Gendreau
- ExoPAG/PhysPAG/COPAG Updates – Alan Boss, Mark Bautz, and Paul Scowen
- The KELT Transit Survey – Scott Gaudi (lunch science talk)
- Large UltraViolet Optical InfraRed (LUVOIR) STDT Study Update – Debra Fischer
- Habitable Exoplanet Imaging Mission (HabEx) STDT Study Update – Scott Gaudi
- Origins Space Telescope (OST) STDT Study Update – Asantha Cooray



THE OHIO STATE UNIVERSITY

- Lynx STDT Study Update – Alexey Vikhlinin
- Reaching for the Stars – STEM Activation Presentation – Pamela Harman

The APAC would like to thank all of the presenters.

In addition, the APAC discussed several additional topics that were not specifically on the agenda.

-
-
- Technology Gaps and the Astrophysics Division's (APD's) efforts to close them.
- Gender representation in the core R&A research programs.

As these presentations will be available online, as will the minutes of the meeting and thus the discussions about these presentations and the additional topics mentioned above, we will not review them here, except as necessary to introduce our findings, recommendations, requests, and concerns.

New Civil Servant Funding Model

Dr. Paul Hertz presented his specific FY18 implementation of the new NASA internal scientist funding model, which has the goal of reducing the number of proposals submitted by the civil servants at NASA centers by one-third, and directs funds to focused research efforts within these centers that have common expertise on strategic topics.

The APAC believes that there may be positive outcomes of the new funding model (in particular taking advantage of the concentration of certain technical and scientific expertise uniquely or best represented at the NASA centers), but nevertheless has some significant concerns. We note that it may reduce the competitiveness of certain subject areas, as it may reduce the probability that non civil servants can get grants involved in research that is already being directly funded at the NASA centers under the new program.

Request: The APAC would like to understand how the reduction in proposal numbers will be implemented and the metrics and standards that are going to be used to judge whether the new civil servant funding model was a success or not in the three-year review. The APAC also requests more information on how setting limits on the number of proposals submitted by NASA Center scientists will be implemented.

Recommendation: The APAC recommends that the APD continues to ensure that any future directed work is truly best done at the centers.

Response to the Request for Input on the High-Risk/High-Impact R&A Charge

The APAC has been charged to “determine how SMD’s Research and Analysis (R&A) program can foster and enable, in the best way, potentially high-impact and highly innovative endeavors, while preserving important foundational and/or more gradual research activities, to the benefit of the nation and scientific community.” In the presentation by Dr. Michael New, in particular, we were asked to address two questions:

- Does the SMD R&A program have effective processes in place to solicit, review and select high-impact/high-risk projects?
- Does the SMD R&A program have effective processes in place to solicit, review and select focused, interdisciplinary, and interdivisional projects?



We were asked to provide a presentation summarizing our input by the November NAC Science Committee meeting.

Response: A subset of the APAC will collect the information provided, and gather answers from the entire committee on the provided questions. We expect a range of opinions of the APAC - we will distinguish between those opinions with and without consensus.

GPRAMA

As is done on a yearly basis as part of the 2010 Government Performance and Results Modernization Act (GPRAMA), the APAC was tasked with assessing whether APD made, in the previous year, appropriate progress toward its three primary science goals:

- Demonstrate progress in probing the origin and destiny of the Universe, including the nature of black holes, dark energy, dark matter, and gravity,
- Demonstrate progress in exploring the origin and evolution of the galaxies, stars, and planets that make up the Universe,
- Demonstrate progress in discovering and studying planets around other stars and exploring whether they could harbor life,

as evidenced by key accomplishments or disappointments.

The evaluation criteria are

- GREEN: Expectations for the research program fully met or exceeded in the context of the resources invested.
- YELLOW: Some notable or significant shortfalls in context of resources invested, but some worthy scientific advancements achieved.
- RED: Major disappointments or shortfalls in the context of resources invested, uncompensated by other unusually positive results.

For 2017, the APAC judged the progress of the APD toward all three of its primary science goals as GREEN.

Areas of common interest with the Human Exploration and Operations (HEO) Mission Directorate (MD)

During the NAC Science Committee in July 2107, there will be a joint meeting with HEO on July 25. Dr. Bradley Peterson, the Science Committee chair, has sent the following introduction and charge to the Science Committee members: "The main purpose of this is to explore possible areas of common interest. HEO will present their cis-lunar exploration plans including the deep space transport and deep space gateway. What I would like each of the science advisory committees to do is think about whether or not there are possibilities for working with HEO Mission Directorate on areas of mutual interest, using this planned infrastructure. The Chair of the HEO Committee, Ken Bowersox, and I have talked to each other on a few occasions, for example, about utilizing HEO Mission Directorate's infrastructure for servicing and/or assembly of large telescopes in space. What I'm asking the individual science committees to do is consider whether these future architectures afford opportunities for mutually beneficial cooperation with the manned program."

The APAC acknowledged a statutory requirement in the 2010 NASA Authorization Act that all new large observatories must be compatible with being serviceable, to the extent practical and appropriate, thus providing a potential opportunity to collaborate with HEO via manned servicing. The APAC also recognizes that we are now "hitting a wall" in terms of the ability to build the missions we are considering, and thus novel methods may be needed, such as on-orbit assembly. This provides another possible collaboration opportunity with HEO.



However, in order to make any specific suggestions about how APD might collaborate with HEO, the APAC would like to hear the perspective of HEO on their expected serviceability and on-orbit assembly capabilities, and how these are likely to evolve over time.

Request: The APAC would like to better understand HEO's timeline, particularly with regards to serviceability and on-orbit assembly, so that we can make well-informed, specific suggestions.

TESS Focus Issue

During the TESS presentation, the APAC were made aware that there was an unexpected focus issue with all four of the TESS cameras, such that they are expected to be out of focus by roughly 20-30 microns during the mission. The impact of the focus shift was quantified as a 10-20% decrease in the planet discovery yield; changes to the planet yield in the simulation are caused by higher photon noise due to less energy in the brightest pixel over the majority of the detector.

The APAC is concerned about this focus shift, and how is it going to affect the stability of the photometry, and how any changes in the stability would affect yield and follow-up. We are concerned that additional losses in planet yield could arise due to systematic errors in the flux time series on the transit timescale. If focus shift manifests itself as flux systematics, there may be software fixes that could be implemented. If not, the community would like to understand changes to the planet yield for strategic planning purposes.

Request: The APAC

SOFIA Science Metrics

The APAC discussed the contents of the response from Dr. Bill Reach (SOFIA Deputy SMO Director) and Dr. Kimberly Ennico Smith (NASA SOFIA Project Scientist) to our request for an update on science metrics from the SOFIA satellite. The response focuses on the GO program, and comes to three primary conclusions:

- Proposal pressure has been steadily increasing.
- Program sees new users proposing and winning time on the Observatory.
- In 2015 and 2016, there were ~20 papers published each year from SOFIA data. Paper production expected to increase due to the ~2.5 year lag from observations to publications.

The committee would like to thank Drs. Reach and Ennico Smith for their work in responding to our request.

Gender Representation in Core R&A Funding

The APAC had a general discussion about the under-representation of female PIs, Co-Is, postdocs, and graduate students on funded R&A programs, sparked by the observation that very few of the ongoing suborbital experiments were led by female PIs.

Request: The APAC requests that APD provide the success rates as a function of gender of the PIs of core R&A research programs, the fraction of proposals in each core R&A research program as function of gender of the PI, and the fraction of peer reviewers as a function of gender. In general, the APAC would like to see a summary of the efforts of the APD to encourage diversity amongst PIs and research teams funded by the core R&A programs.



Miscellaneous Requests Stemming from the Presentations

Two additional requests resulted from discussions surrounding a few of the presentations:

Request: The APAC requests a joint presentation from the three program Chief Technologists that addresses the strategic technology gaps in each subject area, the progress that is being made to close these gaps, and the chief impediments to closing these gaps in a timely manner.

Request: The APAC requests a presentation from the NASA Ames Small Spacecraft Systems Virtual Institute on their activities at a future APAC meeting.

Summary of Major Responses, Actions, Requests, and Recommendations

Response

- In response to the request to provide responses to questions asked in the high-risk/high impact presentation, a subset of the APAC will review the background information provided, gather answers from the entire APAC committee on the provided questions, as well as solicit input on these questions from the PAG ECs. We expect a range of opinions of the committee - we will distinguish between those opinions with and without consensus.

Actions

- The propositions to close out ExoPAG SAGs 13, 15, and 18 were approved by the APAC.
- In the 2017 GPRAMA report, the APAC judged the progress of the APD toward all three of its primary science goals as **GREEN**.

Requests

- The APAC would like to understand how the reduction in proposal numbers will be implemented and the metrics and standards that are going to be used to judge whether the new civil servant funding model was a success or not in the three-year review. The APAC also requests more information on how setting limits on the number of proposals submitted by NASA Center scientists will be implemented.
 - The APAC would like to better understand HEO's timeline, particularly with regards to serviceability and on-orbit assembly, so that we can make well-informed, specific suggestions about areas of common interest.
 - The APAC
-
- The APAC requests that APD provide the success rates as a function of gender of the PIs of core R&A research programs, the fraction of proposals in each core R&A research program as function of gender of the PI, and the fraction of peer reviewers as a function of gender. In general, the APAC would like to see a summary of the efforts of the APD to encourage diversity amongst PIs and research teams funded by the core R&A programs.
 - The APAC requests a joint presentation from the three program Chief Technologists that addresses the strategic technology gaps in each subject area, the progress that is being made to close these gaps, and the chief impediments to closing these gaps in a timely manner.
 - The APAC requests a presentation from the NASA Ames Small Spacecraft Systems Virtual Institute on their activities at a future APAC meeting.

Recommendations



THE OHIO STATE UNIVERSITY

- In regards to the change in the civil servant proposal-funding model, the APAC recommends that the APD continues to ensure that any future directed work is truly best done at the centers.

Sincerely,

Scott Gaudi
APAC Chair
The Ohio State University