

13 August 2018

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 Headquarters (HQ) on July 23-24, 2018. The following members of the APAC attended the meeting in person: Marshall (Mark) Bautz (APAC Vice-Chair), Alan Boss, Laura Brenneman, John Conklin, Asantha Cooray, Brenda Dingus, Debra Fischer, Hashima Hasan (APAC Executive Secretary), Kelly Holley-Bockelman, Victoria (Vikki) Meadows, Leonidas Moustakas, Feryal Özel (APAC Chair), and Paul Scowen. William Jones joined via telecom on both days. Padi Boyd and Beth Willman were unable to attend.

Dr. Hasan opened the meeting by welcoming the APAC members and noting the APAC members who had conflicts of interest with specific topics on the agenda. The conflicted members were asked remove themselves from the members' table as an indication of their recusal during those presentations; 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. Ozel then welcomed the members to the meeting and reiterated some of the FACA and conflict of interest rules.

The agenda consisted of the following presentations:

- Astrophysics Division Update – Paul Hertz
- James Webb Space Telescope Update – Eric Smith
- Gamma Rays and Neutrinos Science Talk – Regina Caputo
- GPRAMA Guidelines – Jennifer Kearns
- Ground Based Support for TESS and other missions – Debra Fischer
- WFIRST Update – Jeff Kruk
- R&A Update – Stefan Immler
- High End Computing Support and Plans – Tsengdar Lee
- COPAG/ExoPAG/PhysPAG Updates – Paul Scowen, Vikki Meadows, and John Conklin
- SOFIA Update – Harold Yorke
- NExSS Update – Natalie Batalha
- SMD Science Activation Program – Kristen Erickson

The APAC thanks all of the presenters for their time and their informative presentations.

In addition, the committee discussed and completed the GPRAMA annual science progress review and took up an additional topic concerning cross-divisional science within the SMD and whether the existing structure presents any barriers to carrying out investigations in such areas.



As a result of the presentations and discussions during the meeting, the APAC has the following findings and recommendations.

APD Report by Dr. Hertz

Dr. Paul Hertz presented science highlights and status updates from NASA astrophysics missions from the recent months. He discussed various elements affecting the APD budget, including a positive change in the topline for the current fiscal year, several changes in directed spending, and the potential impacts of the JWST delay. Dr. Hertz also outlined the timeline for the next decadal survey, which was recently finalized.

Dr. Hertz discussed a number of aspects of the James Webb Space Telescope (JWST) Independent Review Board report that was released in May 2018. An important finding of this review was that there would be an increase in the total budget required for the completion of JWST and that the launch delay as well as the associated additional cost is likely to have an impact on the APD budget in the coming years.

Dr. Hertz reiterated APD's continued commitment to following the priorities set forth in the decadal surveys as well as a commitment to protecting the R&A budget and the Explorer programs in the face of budget uncertainty, including an announcement of opportunity for Explorer programs that is expected to be released in Spring 2019. **The APAC commends the APD and Dr. Hertz for this commitment.**

In response to the JWST delay, the APAC recommends that a plan be developed for identifying and minimizing the science impact of the delayed launch and requests a presentation of such a plan during the fall meeting of the APAC.

James Webb Space Telescope Update

Dr. Eric Smith presented the JSWT update and discussed the Independent Review Board report that was released in May 2018. The APAC thanks Dr. Smith for a clear and transparent discussion that laid out the technical challenges and the proposed solutions.

The APAC found that, given the complexity, the visibility, and the precedent status of the JWST mission, a Lessons Learned report from this project would be of tremendous value to all flagship missions going forth.

The APAC recommends a speedy preparation of such a report to benefit future efforts.

WFIRST Update

The APAC heard from Dr. Jeff Kruk an update on the WFIRST mission. Unfortunately, the vast majority of the committee was conflicted on this presentation and only 3 members were able to join, making meaningful discussions and recommendations very challenging.

Nevertheless, the APAC was pleased with continued progress on WFIRST in face of budget uncertainties. **The committee notes the following developments in the mission: In the most recent reconfiguration in response to the WIETR report, the filter sets were reduced to the minimum number needed for operations; the number of modes on the instruments were reduced; the coronagraph was reconfigured as a technology demonstration, and a minimal pipeline is being developed.**

The APAC noted changes to the scope of the supernova survey as a result of these developments, in that ground-based data is required.



Recommendation: In a future meeting, the committee requests a presentation of the current science and technology demonstration requirements and how they flow down to the present mission design and performance requirements.

SOFIA Update

The APAC thanks Dr. Harold Yorke for providing a SOFIA science update. The committee was pleased to hear that the observatory returned to observations in full capacity following a maintenance period and that the new instruments are providing new science capabilities and results.

The APAC reiterates its position that the observatory should undergo review as with other NASA astrophysics missions, preferably through the senior review process or through a separate review set up by NASA. In the latter case, the committee would like an opportunity to comment on the terms of reference for the review.

HEC Update

The APAC thanks Dr. Tsengdar Lee for an in-depth and sincere presentation that laid out the needs and challenges of NASA's High-End Computing program.

Dr. Lee shared with the committee two primary concerns that need to be addressed in future planning. First, the demand for computing time grows faster than the growth of computing resources. Second, an increasing fraction of the allocated computing time goes unused because of user habits, inefficiencies and challenges in queuing, and inefficiencies in time allocation. Dr. Lee also outlined several solutions that HEC is investigating and potential challenges in their implementation.

The APAC commends the HEC team for a forward-looking view and recommends that they take the following observations and suggestions into consideration in their future deliberations and plans. The committee outlines here only potential directions and recognizes the need for further investigations before any of these solutions could be implemented.

1. The APAC acknowledges the growing computing needs within the APD and the SMD, in general and the need for a long-term plan. The committee recommends that a long-term plan consider options for supporting cloud-computing on external resources as well as growing dedicated NASA computing resources.

2. The APAC recognizes the need for a more efficient management of the existing computing resources. The changes toward higher efficiency could include changes to the way in which computing time or SBUs are allocated (e.g., all at once for a multi-year project to allow for better planning by the user) as well as the deployment of a more refined and better-optimized queue management system than the one that is currently utilized.

3. The APAC is in strong agreement with the HEC that more user/community education for HEC users, such as through townhalls at AAS meetings, could improve user responsibility and lead to a more efficient use of allocated resources by the community.

4. The APAC recommends considering changes to the current two-step time allocation model. For example, small requests for computing time could be evaluated and awarded at the same time as the related ROSES, Hubble, Chandra, etc. proposal. For large allocations, a large project panel, similar to the ones for telescope time allocations, could be convened by HEC. The appropriate "small" and "large" categories in this context should be discussed and determined by the HEC team.

5. HEC could also consider a use-it-or-lose-it model, where users could be allocated funds equivalent to the computing time they are awarded. Any unused funds at the end of a project would have to be returned to HEC.



R&A Update

The APAC heard an R&A update from Dr. Stefan Immler that covered new ROSES elements, a planned NICER GO program, new selection rates for various R&A programs, a new code of conduct for panel reviews, as well new Cubesat programs. The committee was pleased to hear about the numerous positive developments discussed by Dr. Immler.

One area that the APAC noted with significant concern is the selection rate for the NESSF graduate fellowship program, which currently stands at 5%. **The committee noted numerous difficulties with operating a meaningful program with such a low acceptance rate and deferred a more in-depth discussion to a future meeting.**

In preparation for that discussion, the APAC requests relevant statistics including (i) the success rate for other federal graduate fellowships (such as the NSF) and (ii) the average fraction of funds in PI grants, such as those awarded in ROSES, APRA, etc, that are used to support graduate students.

Dr. Immler discussed the current implementation of the internal science funding model at NASA centers and presented a list of the programs that have been funded since its inception. **The APAC wishes to closely monitor the performance of this program, especially its impact on the portion of the R&A program that is openly competed. Examples might include comparison of the internal science funding model and R&A proposal success rates, trends in total funding allocation, and other relevant selection metrics.**

Dr. Immler also briefly touched upon some aspects of diversity and inclusion within the R&A program. **The APAC is aware of Dr. Michael New's ongoing longitudinal study on career pathways of successful PIs within APD programs and requests an update from this work in the Spring 2019 meeting.**

CoPAG, ExoPAG, and PhysPAG Reports

Dr. Scowen reported on the collective responses to the community survey that all three PAGs conducted since the last APAC meeting on the potential delay to the Decadal Survey. The survey results showed that the majority of the community did not support a delay. There were no actions or recommendations resulting from this presentation.

Dr. Vikki Meadows reviewed recent ExoPAG activities and asked for approval of the closeout of ExoPAG SAG 16 on exoplanet biosignatures. The APAC unanimously approved this request.

Dr. Meadows also requested an approval to initiate the new SIG 2 on exoplanet demographics. The APAC unanimously approved this request.

Dr. Conklin reviewed recent PhysPAG activities, focusing on the progress that has been made by the Multimessenger Astrophysics SAG, and also touched upon the community survey results regarding the decadal survey timing. There were no actions or recommendations resulting from this presentation.

NEXSS and Crossdivisional Science within the SMD

The topic of crossdivisional science was taken up by the APAC both through the informative presentation on NEXSS by Dr. Natalie Batalha and as part of a broader agenda item on the larger issue of overcoming divisional barriers that may be preventing the community from taking up any particular science investigations.



Dr. Batalha described the cross-divisional initiative to form a coordinated network for studying planet habitability. The pilot program, initiated in 2015, selected 18 teams from programs that had obtained funding from NAI, XRP, ATP, and ADAP programs in relevant areas and organized fruitful collaborations, meetings, and community white papers, with no additional research funds. The APAC was very encouraged to hear the positive outcome of this effective program that seems to have leveraged existing programs and formed bridges between traditionally disjoint science investigations.

On the broader discussion, **the APAC focused on the need to identify any research areas that may be negatively impacted from traditional divisional barriers. To this end, APAC (i) recommended that a community survey be conducted through the three PAGs, (ii) drafted some questions that may be used in such a survey and (iii) requested that the PAG chairs coordinate further steps in this area.**

Ground-Based Support for NASA Missions

The APAC heard from Dr. Debra Fischer about the need for ground-based observing that is conducted in support of NASA missions. Dr. Fischer focused, in particular, on the example of radial velocity measurement campaigns that have been conducted in support of the Kepler mission and will be conducted in support of the TESS mission. Dr. Fischer underlined the time intensive nature of such surveys and suggested that an inter-agency coordination that allows a more comprehensive look at resource allocation in this direction would be highly beneficial to the planet search efforts.

The APAC acknowledged the long-term need and was in agreement with Dr. Hertz's suggestion that the decadal survey would be a good venue to bring up this issue for prioritization by the community.

SMD Science Activation Program

Ms. Kristen Erickson presented to APAC the recent progress and directions within the SMD Science Activation Program. The APAC was pleased to hear about the issuing of the Cooperative Agreement Notice (CAN) to the community to identify potential connections for teaching science and the next generation of science standards. 27 agreements resulted from this initiative. The APAC commends the efforts to take science teaching to learners in diverse environments and incorporating it to activities outside of traditional teaching venues.

GPRAMA Annual Progress Review

The APAC reviewed the science progress for the Astrophysics Division within the past year. This report was submitted to the APD separately.

Sincerely,



Feryal Ozel
APAC Chair
The University of Arizona



Mark Bautz
APAC Vice Chair
MIT

