



April 26th, 2024

Dr. Mark Clampin
Astrophysics Director
Science Mission Directorate
National Aeronautics and Space Administration (NASA)

Dear Mark,

The NASA Astrophysics Advisory Committee (APAC) had its Spring meeting on March 20-21, 2024. The meeting was conducted in a hybrid mode, with the majority of APAC members being present with Senior Division management at NASA HQ, and aided by WebEx™ video conferencing technology, a digital portal and a chat-window to assist in exchanging APAC, invited speaker, and community comments. The following members of the APAC attended the meeting in person: Jessica Gaskin, Erika Hamden, Kelly Holley-Bockelmann (chair), Alina Kiessling, Mark Mozena, Rebecca Oppenheimer, and Grant Tremblay (deputy chair), while the following attended virtually: Daniela Calzetti, Hsiao-Wen Chen, Shardha Jogee, Sarah Tuttle, and Illaria Pascucci.

Each day, Dr. Hasan began the meeting by welcoming all the APAC members, and explaining the committee's purpose. Dr. Hasan reminded the APAC members who had conflicts of interest with specific topics on the agenda that they were allowed to listen to the presentation but could not participate in the committee's discussion as they are conflicted. Dr. Hasan then read aloud the Federal Advisory Committee Act (FACA) rules. Dr. Holley-Bockelmann then welcomed the members and the public to the meeting.

The committee received updates on the following topics:

Q+A with SMD Associate Administrator – Nicola Fox

The State of the Astrophysics Division – Mark Clampin

COPAG, PhysPAG, ExoPAG Discussion – Shoulah Nikzad, Athina Meli, Illaria Pascucci

TDAMM ACROSS – Jaime Kennea

LISA – Ira Thorpe

Roman – Jeff Kruk

Euclid – Mike Seiffert

XRISM – Richard Kelly

GUSTO – Chris Walker

Discussion of Open Software – Rebecca Lawson and Natasha Batalha

All presentations are available at the [APAC website](#). The APAC thanks all of the presenters for their time and effort to provide detailed and informative presentations.

The APAC has the following specific findings and recommendations in response to the presentations and subsequent discussions.

Findings

Budget: The APAC is sympathetic to the intense budget pressure facing APD. However, the APAC is alarmed and deeply concerned by the implications of the rapid ramp-down in Chandra's operational budget in the FY25 President's Budget Request for NASA, which could mean cancellation or operation at such reduced levels that a viable science mission is unlikely. While NASA plans with the President's Budget Request in mind, the actual budgets are set by appropriators in Congress. Given the lessons learned from FY24, it would be prudent not to commit to FY25 spending plans in a way that locks in catastrophic cuts to major capabilities before Congress decides on the final budget. It is also helpful to have community input on all missions in the portfolio through a senior review process and to know the outcome of the Probe selection to assess the programmatic balance before the premature cancellation of a healthy mission that is continuing to perform ground-breaking science and that supports the majority of the X-ray community.

Less than two years ago, Chandra and Hubble were ranked "Tier 1" in the 2022 Senior Review, and since that top rating, all information available to the APAC suggests that Chandra's efficiency, operational costs, publication rates, and proposal oversubscription rate have remained stable. Since that excellent ranking in the 2022 Senior Review, the Chandra team has returned the High Resolution Camera to nominal operations and restored the Aspect Camera via an innovative flight software patch, all as the observatory has demonstrated enormous synergy with JWST. Going forward, Chandra's TDAMM capability will be critical in the Rubin and Roman era, and will not be matched for several decades to come. Despite this, NASA's budget request shows a ~40% cut to the Chandra budget in FY25, and a further 36% cut in FY26. While the APAC understands that the Chandra/Hubble Operations Paradigm Change Review (CHOPR) will consider the proposals to reduce operations for both projects, we are concerned that the magnitude of the Chandra cuts will preclude any meaningful science operations beyond a minimal program in 2025, followed by what would likely be closeout of the mission. The APAC is unanimous in its view that the loss of Chandra will erode US leadership in high energy astrophysics, and will affect international partnerships as well.

Meanwhile, the APAC found that the establishment of a \$10M Project Office for the Habitable Worlds Observatory in FY24, a mission that has not yet undergone adoption, is an unfortunate line item. In this budget climate, the further FY25 President's Budget Request of \$50M for Habitable Worlds Observatory technology maturation has an outsized effect on the rest of the portfolio.

ACROSS: The APAC was impressed to see the progress on TDAMM with the pilot Astrophysics Cross-Observatory Science Support (ACROSS) initiative. The APAC is unanimous in its view that awareness of and coordination between observatories within the NASA mission portfolio is a necessary first step in efficiently responding to alerts, and the APAC appreciates that there will be an Advisory Group composed of representatives from each mission. The APAC is cognizant that ACROSS intends to extend its reach to include ground-based facilities and international partners, and aims for open and equitable access to its tools, training, and infrastructure, and the APAC finds these plans are important next steps to build a TDAMM ecosystem.

Explorer Program: The APAC is concerned about the Explorer program and its negative impact on the proposing teams. The proposal process is counter to NASA's core value of inclusion and is a barrier to diversity, equity, and accessibility. The years-long burden of pre-Phase A and Phase A is costly, in terms of both workforce and budget, and these costs are much larger than what is required to comply with the Announcement of Opportunity. In addition, the combination of an elongated Phase B and a flat budget creates mission risk due to the difficulty in retaining science, engineering and management talent. The third consecutive non-selection of Missions of Opportunity has damaged potential PIs, technologists, and scientists alike who have devoted years of their professional careers into developing concepts that fail to move forward merely for programmatic reasons – not science or risk.

Open Software: The APAC appreciated a frank discussion of the issues surrounding open software. There are significant community concerns toward protecting early career scientists, incentivizing developing open software, and providing resources to maintain open source software, databases, and libraries. Current policies, funding structures, and cultural norms have yet to catch up to the move toward open science.

SCaN: Although this APAC meeting did not have an explicit presentation on Space Communications and Navigation (SCaN), the APAC continues to be concerned about the dramatic and increasing oversubscription on SCaN assets that is burdening an already aging infrastructure. With Roman requiring large throughput and TDAMM requiring a nimble response, the current and even anticipated SCaN capabilities are insufficient. While the APAC is concerned with ensuring the health of APD missions, SCaN undergirds the entire NASA portfolio and should therefore be a top NASA priority.

Recommendations

The APAC strongly recommends that APD continue the Chandra mission at the current FY24 level, and not proceed with a major budget cut before all possible budgetary trades are considered. We have identified several potential areas for cost savings with less impact, and the APAC strongly recommends that an independent team consider the budgetary, programmatic, and community implications of the following, in order of priority:

- 1) **HWO:** There are synergies between HWO technology maturation and the existing fleet, such as the Roman coronagraph and Hubble UV capabilities. It may be possible to identify ways in which APD can use HWO Project Office and tech maturation funds more efficiently to optimize savings elsewhere. For example, developing the HWO coronagraph may be aided by ground testing and calibration of the Roman coronagraph; pipeline development, simulations, and ground segment operation planning may be novel testbeds for technology maturation as well.
- 2) **Roman:** The APAC has been kept apprised of Roman's status and is pleased to see it progresses within its cost and schedule margins. Roman may be able to maintain its cost and schedule commitment with a few percent budget cut.
- 3) **Guest Observer programs:** The APAC discussed many options to reduce overhead within the GO programs, from pooling multiple GO proposals in various iterations (HST/JSWT, HST/Chandra, all flagships) to moving archival GO programs to ADAP and/or theory proposals to ATP. The APAC reached no consensus on which option, if any, to formally recommend; however, there was a consensus that the independent team should analyze options for reorganizing GO programs to mitigate redundancy.

The APAC recommends that APD support a review of the Explorers Program, if so deemed by the SMD Deputy Associate Administrator for Research.

After reviewing the Terms of Reference, the APAC approves two Science Analysis Groups: Technosignatures and Exoplanet Reflectance Spectroscopy for the Habitable Worlds Observatory.

The APAC recommends the APD convene a working group to evaluate how to implement the solutions outlined in the Open Software presentation, such as awards for time with professional developers to aid in software development, mechanisms to ensure credit for open software developers, and training to encourage developing open software.

Relatedly, the APAC agrees that an open science discussion would be better informed by data on the effects of open data and software on the community, and recommends that APD conduct an investigation on metrics such as time to publication of observations, the author of first paper resulting from an observation and the relation

to the PI, the level of participation for under-resourced groups and other metrics as needed.

The APAC endorses the ACROSS pilot and encourages stronger coordination and cooperation with NSF pilot initiatives to avoid duplication and maximize impact. It may be useful to explicitly combine NASA and NSF initiatives into one cross-agency effort.

The APAC recommends that APD enlist SMD to prioritize SCaN maintenance and upgrades before Roman is launched.

Requests for Information:

The APAC looks forward to an update from the AWESOM SAG.

The APAC would appreciate a presentation by SCaN about the state of optical communications for different orbit regimes, including the outlook on soliciting proposals for optical communications development at a future meeting.

The APAC looks forward to an ACROSS update in one year.

Sincerely,

A handwritten signature in blue ink, appearing to read "KH", is positioned below the "Sincerely," text.

Kelly Holley-Bockelmann, on behalf of APAC