



August 9th, 2024

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

Dear Mark,

The NASA Astrophysics Advisory Committee (APAC) had its Summer meeting on July 23-24, 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: Daniela Calzetti, Regina Caputo, Hsiao-Wen Chen, Jessica Gaskin, Shirley Ho, Mark Mozena, Rebecca Oppenheimer, Ilaria Pascucci, Grant Tremblay (standing Chair), and Sarah Tuttle (standing Deputy Chair), while the following attended virtually: Kelly Holley-Bockelmann and Shardha Jogee. Each day, Dr. David Morris began the meeting by welcoming all the APAC members, and explaining the committee's purpose. Dr. Morris 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. We note that Grant Tremblay and Jessica Gaskin were conflicted on all *Chandra/Hubble* Operations Paradigm Change Review (OPCR) issues presented at this meeting. They were recused from OPCR-relevant discussions during the meeting, as well as in the related Findings and Recommendations below. Dr. Morris then read aloud the Federal Advisory Committee Act (FACA) rules. Dr. Tremblay welcomed the members and the public to the meeting, with some positive words about the global societal impact of NASA Science, and an ask that everyone treat each other with kindness and grace during this stressful and difficult budget environment.

We note that, on Wednesday July 24, a security incident occurred on the WebEx platform, and the meeting had to be abruptly halted at 9:27am ET. NASA Security and Senior Management were immediately informed, and a two hour recess was called in order to discuss how the meeting could be resumed in accordance with FACA rules.

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

The *Chandra/Hubble* Operations Paradigm Change Review (OPCR) findings were presented to the APAC by Prof. Robert Kennicutt. The APAC thanks and commends the OPCR committee for delivering a thorough and thoughtful analysis, especially on such a compressed schedule. The APAC was not allowed to be involved in the OPCR process, did not receive the report, and was informed before the meeting that the APAC was not asked to comment on the results. We note, however, that fruitful discussion during the meeting clarified that APD would welcome comments from APAC on the OPCR. While we are sympathetic that APD is facing severe budget pressure and that difficult decisions must be made, we remain concerned about the lack of oversight and transparency in this process; the APAC is a Federal Advisory Committee charged with making formal recommendations on the priorities of the Astrophysics Division and should therefore at least be cognizant of any planned major changes to the astrophysics portfolio before they are made. We also note that an important role of the APAC is to inform the community about APD decisions and rationale, and that this function would be valuable to help the community restore trust in the Division.

The APAC also remains concerned that NASA has taken preemptive budget actions that have led to severe yet preventable impacts. In balancing the budget, the APAC urges the APD to also consider balancing science and budget. In particular, there are strong synergies between current and future missions, including Hubble, Chandra, JWST, and Roman, to support ambitious projects and enable big discoveries. The APAC understands that a nimble response is sometimes needed, particularly given the unpredictability of the appropriations cycle or when operating under a continuing resolution, but premature cancellation of Hubble or Chandra have downstream effects that will last a generation.

We also acknowledge that the responsibility for how a mission allocates its budget is not fully in APD's control. To both APD and STScl, the APAC reiterates its April 2024 letter: *'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.'*

The APAC received a report on the 2025 planned Senior Review and requested minor wording changes to the call for proposals, to be released on August 12, 2024, concerning adding data analysis to the criteria in the proposal call. The APAC notes that having the

OPCR and a Senior Review less than a year later does pose a challenge to both the Hubble and Chandra teams.

The presentation on APD technology development efforts and Small-Mission balance provided an informative background and history on these APD investments. The Astrophysics Research and Analysis Program (APRA) and the Strategic Astrophysics Technology (SAT) funding have increased over the years, and the community is effectively infusing developed technologies into flight missions. Despite the increase in investments in APRA and SAT, the selection rates have significantly decreased, impacting the science community's ability to develop, maintain and implement technologies needed for future missions. Regarding Small-Mission balance within the portfolio, the APAC finds that the balance between technology development and suborbital/small missions is appropriate. The APAC also finds that an additional technology-maturation Small-Mission program would be beneficial to add to the APD portfolio.

The APAC acknowledges the tremendous effort that went into compiling the Time-Domain And MultiMessenger (TDAMM) Communications Science Analysis Group report. The report outlines the unique technical challenges in rapid communication and dissemination of alerts in the variable, transient, and extreme universe, through multiple case studies that reflect possible operational scenarios. Of primary concern is the lack of a transition plan from TDRSS to an operational Commercial Services Project (CSP) and clear direction from APD on a feasible solution during this gap.

The APAC appreciates the SCan presentation, which summarized its history and origin as well as the pivot from the Tracking and Data Relay Satellites System (TDRSS) to the CSP. CSP will provide robust services from multiple providers, who are also supported by other government agencies and industry. However, there are uncertainties related to Astrophysics-mission-specific services to be provided, their costs, interoperability between providers, and lack of control by NASA related to cost and usage. Several APAC members were concerned with the lack of accountability and similar lack of a chain of command in terms of interacting with Space Communications and Navigation (SCaN).

The APAC thanks the Program Analysis Groups (PAGs) for providing 1-page summaries outlining requests to APAC to better facilitate the approval and closeout process for initiatives. With a strategic retreat and an early-career workshop, the Physics of the Cosmos PAG (PhysPAG) has made excellent progress toward increased engagement. The APAC looks forward to the Exoplanet PAG (ExoPAG) Science Analysis 2023 (SAG23) report on Exo-zodiacal dust in FY24, and acknowledges ExoPAG's continued concern on exclusive use period. The APAC was pleased to see Cosmic Origin PAG (COPAG)'s continued progress on implementing strategic plans and active participation in all activities. The APAC was asked to forward the following concerns from the COPAG Town

Hall: 1) SAT selections were about exoplanet science, not Cosmic Origins and not Habitable Worlds Observatory; 2) APRA only solicited technologies relevant to high priority Decadal recommendations, which limited the innovative intent of the program; 3) Science Technology Architecture Review Teams (START) and PAG activities are volunteer positions, which restricts participation to those researchers with existing resources for travel and other support.

APAC acknowledges SPHEREx's progress and issues prior to launch and fully endorses the project's plans to mitigate any difficulties. APAC anticipates exciting science from this mission soon.

The APAC applauds APD for its forward-thinking and equity-minded re-envisioning of a NASA graduate fellowship. The SMD-wide Future Investigators in NASA Earth and Space Science and Technology (FINESST) fellowship has an 7.6% success rate in APD, with a disproportionate number of awards going to select R1 institutions and very little participation from R2, R3, MSIs and 2-year institutions. In addition, FINESST pits first-year graduate students against very experienced ones, which lacks fairness. In its current incarnation, FINESST does not align with the ethos of the APD. The APAC agrees with need to customize a graduate fellowship program for APD, and endorses creation of the proposed STudent Astrophysics Research (STAR) Grant

APAC is pleased to hear of the progress with the cross-PAG Astrophysics with Equity Surmounting Obstacles to Membership (AWESOM) Science Analysis Group and welcomes the planned report. The AWESOM presentation mentions sending an open survey to Primarily Undergraduate Institutions, Community Colleges, and Minority Serving Institutions to gauge the research infrastructure, activity level, and research needs. The plan is to send the survey to faculty to select astronomers in Texas and California two weeks after school starts, and to canvas the entire community through email blasts. The APAC is concerned about the potential low response rate due to survey fatigue, particularly among under-served communities.

RECOMMENDATIONS

Chandra/Hubble Operations Paradigm Change Review

The APAC understands that flagship missions do end, and recognizes the difficult task of balancing the portfolio amid a highly constrained budget. However, NASA's own OPCR committee found that both Chandra and Hubble are "*highly streamlined after years of improvements*", while both missions remain heavily oversubscribed, scientifically productive, and synergistic with current and future ground- and space-based observatories, including JWST and Roman. The APAC recommends that budget cuts to Chandra and Hubble be kept at the minimum possible level, and that the irreversibility of workforce layoffs be given greater priority in making budget trades. Clearly, investment in

future missions and balancing the portfolio is important, but the community-wide damage done by irreversible cuts to two operating and highly productive Great Observatories now can have lasting effects that far outweigh the benefits of accelerated technology maturation for a facility that may be decades away from launch. We recommend that APD take all reasonable action to preserve the unique science capabilities of these two operating Great Observatories, and to retain the resources needed to support the analysis and publication of their science output. Both chambers of Congress, through a House Authorization bill and two Commerce, Justice, Science Appropriations bills, have expressed clear opposition to reductions in *Chandra's* operating budget. The APAC recommends that APD take no irreversible action with regards to Chandra and Hubble staff until completion of the next Senior Review, which should come at a time when we will have more clarity as to the FY25 Appropriations process.

Further, the APAC recommends that, going forward, APD follow more transparent procedures for large changes to the budget, priorities, and mission portfolio. The APAC strongly recommends that APD defer making major, irreversible choices until they are absolutely required to, and to defer to established community processes such as the Senior Review, mid-Decadal, and Decadal Surveys.

APD Tech Dev and Small-Mission balance

APAC recommends APD consider adding a technology-maturation Small-Mission (CubeSat-class at ~\$10M level) program to the APD portfolio. Rather than including this opportunity under the SAT Program, APD should consider including this under Pioneers. The APAC also recommends that APD discuss synergies with STMD for technology maturation missions, in general, as an opportunity to partner on common technology goals for the Agency.

The APAC also recommends that APD edit the wording in the APRA and SAT solicitations to make the difference between the two opportunities more apparent and to better delineate which types of efforts should be proposed to each. As HWO technology development migrates to within the purview of HWO Project Office, one consideration for the SAT would be to include future strategic flagship, probe, and TDAMM mission technologies in this call. APAC requests that these changes be made available to proposers well before Notice of Intent is due. A presentation at the Spring APAC meeting on this topic is requested.

TDAMM COMMS SAG Report

APAC recommends that APD work with the Program Office to provide a viable solution for the TDAMM community (high-coverage, high-bandwidth, low-latency communications in Low Earth Orbit (LEO) and non-LEO orbits during the operational gap between TDRSS and CSP. The APAC recommends APD investigate the possibility of distributing a Request of

Information or Request for Proposals (RFI/RFP) to industry to identify and select an industry partner(s) who can accommodate NASA's TDAMM needs during this time.

APAC recommends that APD consider a trade study to determine the value of removing the cost of comms from the PI-Managed Mission cost, and offering it as a service (in much the same way that balloons and launches are removed from PI-Managed Mission costs of suborbital flights) to selected TDAMM missions. Potential value of removing these costs from the PIs, puts the burden of negotiating costs on APD, rather than on proposing teams and provides consistency of cost between competing missions.

SCaN Overview of Commercial Space Relay Transition

APAC recommends that APD establish a dedicated representative to work with the SCaN Program Office to take into account TDAMM operations as CSP comes online to establish requirements and develop a cost model that is consistent with missions at all scales.

SPHEREX

The APAC recommends that the current data and level 1-3 analysis plan be more clearly defined given the complexities of the analysis of a large data set with a large number of channels in each pixel over all sky. The team should demonstrate the readiness of the suggested methodology to identify sources with a mission level simulation. Further, the APAC recommends the mission develop a more detailed level 4+ analysis plan, as the launch date is quickly approaching.

STAR Grant

The APAC recommends that APD implement the STAR Grant as soon as is feasible. Of the changes mentioned in the presentation, the APAC recommends: 1) adopting tracks that separate early researchers from those with thesis research well underway; 2) increasing the award amount; 3) exploring a full panel review; and 4) requiring a budget only from students with awards. The APAC recommends against limiting the number of proposals submitted from each institution, as this may have the counterproductive effect of reducing submissions from under-resourced institutions that may lack the infrastructure for internal proposal evaluations. To broaden participation beyond R1 Primarily White Institutions (PWIs), APD may consider exploring a [Campus Champion](#) model, in which designees at institutions are responsible for raising awareness about STAR and assisting with the application process.

AWESOM

APAC recommends that instead of, or in addition to, the planned survey distribution method, AWESOM leads reach out to the National Society of Black Physicists (NSBP), the National Society of Hispanic Physicists (NSHP), and the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) for distribution, as well as conduct

the survey at society conferences. Coordination with COPAG and HWO to advertise and administer the survey at NSBP/NSHP and SACNAS conferences is encouraged.

APAC notes that given the restrictions from the state legislature on DEI-related activities in a number of states, we recommend using the language, such as “expand the range of institutions and backgrounds for members of the community contributing to NASA astrophysics”, rather than the word “DEI”.

REQUESTS FOR INFORMATION

APAC requests that SCan provide a status update to APAC during the Spring 2025 on how the Program Office is addressing uncertainties related to the establishment/negotiation of capabilities, cost models, interoperability, networking and communication, as well as to better outline the chain of command and mechanisms to ensure accountability.

APAC would like to invite key authors of the 2nd TDAMM Infrastructure workshop [white paper](#) to present their findings in the next APAC meeting. This will reaffirm the science and requirements referenced in the TDAMM COMMS SAG report.

APAC would like an update on the implementation of zero-proprietary time at a future meeting and would like to know if community input will be solicited.

The APAC has been interested in how much NASA invests in cross-division initiatives such as machine learning/AI and tech development. One way to address this is a crosscut budget analysis, performed regularly by many federal agencies including the Department of Energy. The APAC would like to understand to what degree this may already be done within APD, and asks for APD’s thoughts on the usefulness of crosscut budgets at the next Division Director update.

Relatedly, it would be interesting to understand how STMD funds cross-division science, such as exoplanet research or technology development. The APAC would like to know how shared resources and synergistic interests can be used to offset tight budgets within APD; perhaps this can be addressed briefly in the next Division Director update, as well.

The APAC would appreciate a brief update from AWESOM at a future APAC meeting, with a fuller presentation following the conclusion of their planned report in 2025.

Sincerely,

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Kelly Holley-Bockelmann, on behalf of APAC