

NASA Astrophysics

ASTROPHYSICS ADVISORY COMMITTEE

October 19-20, 2023
Hybrid Meeting

MEETING MINUTES



Kelly Holley-Bockelmann, Chair

Hashima Hasan, Executive Secretary

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Introduction and Announcements

Dr. Hashima Hasan, Executive Secretary of the Astrophysics Advisory Committee (APAC), called the meeting to order. As this was a Federal Advisory Committee Act (FACA) meeting, it was open to the public and all statements were to become part of the public record. While discussions during the meeting were open to APAC members only, the public would have opportunities to ask questions via the WebEx chat feature and a web portal. Otherwise, members of the public would be muted. All APAC member conversations were to be on the record, and formal minutes were being taken.

The NASA Science Mission Directorate (SMD) Associate Administrator (AA) had appointed the Committee members on the basis their subject matter expertise; as such, they must comply with Federal ethics laws applying to Special Government Employees (SGEs). Committee members were required to recuse themselves from discussion of any topics for which they had personal or institutional financial conflicts of interest (COIs). For this meeting, the following members had known COIs: Dr. Alina Kiessling, Nancy Grace Roman Space Telescope (Roman); and Dr. Regina Caputo, Roman. Any members finding additional COIs were obliged to tell Dr. Hasan and recuse themselves during the discussion. Members should address any ethics questions to Dr. Hasan. She then introduced Dr. Kelly Holley-Bockelmann, APAC Chair.

Dr. Holley-Bockelmann welcomed the participants and asked Dr. Hasan to conduct roll call of the APAC members. Once it was confirmed there was a quorum, Dr. Holley-Bockelmann introduced Dr. Mark Clampin, Director of NASA's Astrophysics Division (APD).

Astrophysics Division Update

Dr. Clampin began the APD update by showing the organizational chart. The Division comprises four major areas: Cross-Cutting, Flight Programs, Research and Analysis (R&A), and Astrophysics Strategic Missions. Dr. Clampin gave some updates on the program executives, program scientists, and other staff. He then presented a graphic of the NASA astrophysics mission fleet and reviewed some of the high-level numbers relating to research, missions, technology development, publications, smallsats and cubesats, sounding rockets, and balloons.

The European Space Agency (ESA) launched the Euclid mission in July, for which NASA contributed a camera for the Near Infrared Spectrometer and Photometer (NISIP) instrument. The mission is currently in performance verification. Early issues have been addressed and science commissioning is being completed. There have been some adjustments to the observation schedule. The X-Ray Imaging and Spectroscopy Mission (XRISM), a collaboration with the Japanese Aerospace Exploration Agency (JAXA), launched in September and commissioning is going well. This will investigate the x-ray sky using high-resolution spectroscopy and imaging. Initial observation releases will occur later this year for the benefit of the press, but calibration will be continuing.

Science highlights

The James Webb Space Telescope (JWST, or Webb) is at the beginning of its second year of operations. Dr. Clampin noted some highlights, including an exoplanet with evidence of carbon-bearing molecules, including methane and carbon dioxide. Planet K2-18 b appears to have the dimethyl sulfide (DMS) molecule, which indicates the possibility of life. Additional observations will delve into this further. Dr. Clampin also discussed Webb's new images of the Orion Nebula, taken as part of effort to follow up on Hubble Space Telescope (HST, or Hubble) views. Webb is confirming Hubble's measurement of the Universe's expansion rate, the Hubble Constant. Finally, the Imaging X-ray Polarimetry Explorer (IXPE)

and Chandra X-ray Observatory (Chandra) have both looked at the area around Sagittarius A*, the supermassive black hole at the core of the Milky Way. IXPE has shown that the x-rays are polarized.

Mission status

For Roman, a flagship mission in development, there has been a recent update on the status and accomplishments of the Wide Field Instrument (WFI). There was to be a full presentation on Roman at this APAC meeting, but meanwhile, Dr. Clampin noted that it has made good progress and the instrument carrier has been delivered.

The Spectro-Photometer for the History of the Universe, Epoch of Re-ionization, and Ices Explorer (SPHEREx) mission is a Medium-Class Explorer (MIDEX) in development, with launch planned for 2025. The mission will provide the first all-sky spectral survey and allow scientists to analyze data on close to 500 million galaxies and more than 9 million stars in the Milky Way. The effort will emphasize the origins of the universe. The payload has been integrated and is being tested, with system integration review planned for November and Key Decision Point B (KDP-B) in early 2024.

The Galactic/Extragalactic ULDB Spectroscopic Terahertz Observatory (GUSTO) mission will expand our understanding of the inner workings of the Milky Way and the Large Magellanic Cloud through far-infrared surveys. Unlike other Explorers, this one is a balloon. The payload is en route to New Zealand and will launch from Antarctica in December.

In a quick summary of operating missions, Dr. Clampin said that the Neil Gehrels Swift Observatory (Swift) continues to do good science despite some modest operational issues. The Fermi Gamma-ray Space Telescope (Fermi) had some conjunction risks that have been mitigated. The Colorado Ultraviolet Transit Experiment (CUTE) is a cubesat for UV/optical astronomy and exoplanet transit spectroscopy, launched in September 2021 and in extended mission. This was selected through the Astrophysics Research and Analysis Program (APRA) and is an example of how smaller missions can produce exciting science.

The Neutron Star Interior Composition Explorer (NICER), on the International Space Station (ISS), had some recent issues when a thermal shield was punctured, resulting in a light leak. While this does not affect night observations, it does jeopardize the quality of daytime observations. The mission and ISS teams are looking at a repair strategy that would involve installing a small plug at the puncture, probably to be done mid-2024 during an Extra-Vehicular Activity (EVA). Meanwhile, the Transiting Exoplanet Survey Satellite (TESS) continues doing excellent work.

The Hubble Space Telescope (HST) is still oversubscribed. After a problem with Gyro 3, the mission team made some change in the gyros as endorsed by the Anomaly Review Board, transitioning to “high rate” mode, which is a fully functional science mode. Ongoing work on the B-side operations software will eventually allow operational redundancy to be regained.

The James Webb Space Telescope (JWST) is 14 months along in operation, finishing Cycle 1, and moving into Cycle 2, with a call out for Cycle 3 Guest Observer (GO) program. A bar graph showed proposal acceptance by institution. Over 400 articles have been published thus far. The operations team has implemented a Micrometeoroid Avoidance Zone (MAZ) constraint to help minimize micrometeoroid impacts on the primary mirror. As expected, the mission gets about 2.5 micrometeoroid impacts per month, but the team is doing everything it can to protect the mirrors. The Mid-Infrared Instrument (MIRI) team identified a loss of sensitivity in long wavelengths. This appears to be stabilizing but a similar issue exists in long-wave imager filters. The mission team is still trying to understand and address this. Dr. Grant Tremblay pointed out that the science community is distressed by this and asked if contamination has been ruled out. Dr. Clampin said that the anomaly board has to complete its work and he will make

their report available when it is out. Dr. Holley-Bockelmann asked if this constitutes a significant fraction of observing time. Dr. Clampin said that it does not, and another program is adding observations. The telescope is extremely stable and calls for very infrequent mirror alignments compared to what was anticipated. This gains back quite a bit. The issue is slow and not concerning, and it does not affect wavelength error, which is better than expected.

Budget

Dr. Clampin next turned to the budget, explaining that he would be talking about Fiscal Year 2024 (FY24) and that he could not discuss FY25 because it was embargoed. At the time of the meeting, there were no appropriations for FY24 and the Federal government was looking at a potential shutdown. He presented a timeline of the Federal budget process. The budget agreement from June called for maintaining FY23 spending levels, and it is possible that NASA's final appropriation could be significantly below the President's Budget Request (PBR). In addition, both the House and Senate have draft appropriations bills that have NASA taking cuts from FY23. Therefore, consistent with the rest of the Agency, APD is planning for a lower budget. There are risks that a Continuing Resolution (CR) with FY23 levels could lead to steeper cuts if the appropriations are below those levels.

Dr. Clampin showed several slides with the astrophysics fleet by size and stage of development or operation. There are also international partnerships. His job entails keeping a balanced portfolio of missions and science, which he does by relying on the APD principles document for managing reduced budgets. Current considerations include continuing work on the most recent Decadal Survey (DS) recommendations. These include Roman from the 2010 DS, and the Habitable Worlds Observatory (HWO), Time Domain Astrophysics and Multi Messenger (TDAMM) astronomy, and a probe mission from the 2021 DS. The documents also addressed maintaining a healthy R&A program; the cost of large missions in extended operations; international partnerships; and the Explorer Program cadence.

The FY24 budget decisions coming out of these considerations include adjustments to the Chandra and Hubble budgets, with a mini-Senior Review (mini-SR) in 2024 once the FY25 PBR has been released. APD will fully fund Roman and keep it on schedule. The Division will also commit to the Explorers in development. Regarding international partnerships, NASA will transition its management of activities related to ESA's Large Interferometer Space Antenna (LISA) to the Explorer office following ESA adoption. NASA investments in ESA's Advanced Telescope for High-ENergy Astrophysics (ATHENA) mission were reduced when ESA began reformulating the mission and asked NASA to review and change its contributions. Some funding will be set aside for HWO in order to keep moving forward. He could not discuss specific numbers yet because the affected programs were still evaluating their options and everything was notional pending appropriations. The FY23 HWO allocation was small, just enough to allow the project to start. APD has funded some teams to put out contracts, but this is not significant and is well below the DS recommendation.

Dr. Jessica Gaskin said she appreciated these challenges. She was concerned about the flagship missions in extended operations and how NASA will weigh the long-term consequences of HST and Chandra cuts. Dr. Clampin explained that NASA most likely will have to reduce them soon as there is nowhere else to go. He has asked the teams to look at how they might address this. Chandra already has some challenges in thermal management that affect the ability to continue science. The essential issue is whether to rely on missions the Agency might lose, when faced with the need to keep investing for future. If NASA does not do the latter, the long-term impacts will be much worse. For x-ray astronomy, the big picture includes XRISM, a MIDEx down-select that includes x-ray, and an upcoming Probe Announcement of Opportunity (AO) that calls for x-ray, among others. He is very mindful of the impact on the x-ray community. However, he must deal with financial issues. Dr. Ryan Hickox asked about the aims and likely process for the mini-SR, given that the missions have been directed to cut and a full SR occurred recently. Dr. Clampin replied that the APD budget is likely to be flat for FY24, and the FY25 PBR will be

part of the mini-SR, which will discuss how to maximize science in these missions. It will provide additional guidance for FY25 and look at both long- and short-term adjustments, with emphasis on the longer view.

Dr. Erika Hamden expressed concern about the postponement of the Pioneers call. She added that members of the community advocate through their institutions and take it outward to Congress. Dr. Clampin said that he does not want to disenfranchise the next generation of scientists and so will maintain the R&A budget. He cannot discuss everything being considered. He added that Pioneers is important and the postponement is not a cancellation. A lot of what APD is looking at is in the early stages. He was also wary of cancelling a MIDEX or Probe. Regarding a rumor that cubesats are cancelled, that is not true. They do cost more than anticipated but APD is adjusting. The Division does not know what the appropriation will be and is working with the best picture available.

Dr. Clampin explained that Roman is going well, with the Forward Optical Assembly (FOA) complete and the Integrated Optical Assembly (IOA) integration in progress. The mission is staying on schedule. A graphic showed the current status and planned schedule for Explorer selections, though a shutdown would affect the timing of the down-select for the MIDEX. APD manages the Balloon Program for all of SMD. This program flies some student platforms; a slide listed recent activities. Five Pioneers projects are underway, four of which were selected from Pioneers-2020. Selections from Pioneers-2022 are being deferred pending clarification of the FY24 and FY25 budgets. Four cubesat projects are underway and, as noted, CUTE is in operation. APD looks at these at least monthly.

Other Activities

The Science, Technology, Architecture Review Team (START) will involve the community in defining the goals, objectives, and observations for HWO. START will examine architectures and instrument options and begin development of the Science Traceability Matrix. This activity will cut across disciplines for scientists, engineers, and others. The co-chairs have been selected based on expertise and leadership experience. They are involved in member selection. Similarly, the Technical Assessment Group (TAG) is moving forward. The Group will be responsible for involving the community and ensuring the responsiveness of the project to the Astro 2020 recommendations for HWO. There are two science co-chairs and two engineering co-chairs for the TAG.

SMD instituted the Internal Scientist Funding Model (ISFM) in 2016 and 2017 to address concerns about the amount of time NASA scientists spent competing against themselves. This program directs a relatively small percentage of technology funding to the appropriate experts at the NASA centers. The percentage of ISFM packages has been in the 11-16 percent range, well below the cap of 25 percent. Dr. Clampin listed specific programs by center. These are competed within the centers themselves every 3 years, so there is some competition involved. Dr. Tremblay observed that the pre-ISFM situation sounded nightmarish and asked if the program relieves pressure. Dr. Clampin replied that he worked on the ISFM charter, and one of the complications was that the SMD divisions each manage R&A very differently. He believes they did their best under those circumstances.

He next discussed the Nancy Grace Roman Technology Fellowships, instituted in 2014. Two members of APAC, Drs. Hamden and Caputo, are alumnae of the program.

APAC Recommendations

At the previous APAC meeting, the Committee made the following recommendation:

“The APAC requests an update from an LGBTQ Special Emphasis Project Manager at Headquarters, Goddard Space Flight Center, or Jet Propulsion Lab at the Fall 2023 meeting on APD IDEA efforts specifically for the LGBTQIA+ community.”

SMD is working on a response across the divisions as part of an effort to provide opportunities aimed at creation of a safe and inclusive working environment. The centers have similar initiatives. Dr. Holley-Bockelmann expressed her frustration that NASA has still not directly responded to this recommendation, despite that fact that it was made in several previous APAC letters. NASA has still not specifically addressed its efforts for the LGBTQIA+ community. Dr. Holley-Bockelmann reminded the attendees that this recommendation was made as a direct response to the perception that NASA was not responsive enough to LGBTQIA+ astronomers regarding the naming of the JWST.

Related to Inclusion, Diversity, Equity, and Access (IDEA), there are new data on the impact of Dual Anonymous Peer Review (DAPR). Thus far, there appear to be significant changes in selection rates for institutions that are Primarily Undergraduate (Primarily UG) and non-R1 (aka “prestigious”) Minority Serving Institutions (MSIs). These changes are precisely the benefits sought under DAPR. APD has other ongoing and planned IDEA initiatives. Research Opportunities for Space and Earth Science (ROSES) pilots of inclusion plans (IPs) are continuing. While IP assessment criteria are not included in evaluation criteria, IPs that are deemed inadequate must be revised before NASA releases funding. Dr. Hamden said that she has heard that there is insufficient clarity about what IPs must include. Dr. Nino Cucchiara of APD said that the language will be clarified in the ROSES solicitation from ROSES22 to ROSES23. The Division heard from the community and has set new standards, as well as workshops and training opportunities for funded PIs. The latter will eventually expand to every PI, not just the funded ones. The goal is for each team’s environment to be specific to their needs and size. This is a pilot that APD is doing as part of an SMD-wide initiative, in concert with the other SMD divisions, so coordination is necessary. Changes and improvements will continue, with an emphasis on communication. In most cases, the ROSES-22 IPs were excellent and exceeded expectations. There were one or two teams that required further work.

Dr. Clampin described additional APD IDEA initiatives, emphasizing in-person and virtual visits to organizations and institutions that focus on underserved populations.

He returned to addressing APAC recommendations from the June 2023 meeting. For JWST, APD forwarded a recommendation to the user committees sponsored by the Space Telescope Science Institute (STScI). APAC also approved a Science Interest Group (SIG) for TDAMM and a Science Analysis Group (SAG) for starshade science; these have been formed. A recommendation related to the TDAMM capabilities of the aging astrophysics fleet runs into the minimal to nonexistent flexibility to baseline new missions. However, reports, R&A activities, community analyses, and discussions with other government and international partners help put the Division in a position to move forward once it is possible.

APAC also advised APD to study the impact of increasing the Future Investigators in NASA Earth and Space Science and Technology (FINESST) proposal selection rates to be more in line with other ROSES proposals. APD discussed this at its annual R&A retreat, which occurred recently, and will share results at the next APAC meeting. APD does not have the staff to investigate the ethics and best practices of Artificial Intelligence (AI), but SMD is looking at this topic. A recommendation to have a consultant look at some of the IDEA issues raised during the Swift SR was unclear in terms of implementation. IDEA is already a factor in proposals and the NASA centers have staff dedicated to this area. Another recommendation concerned participation of Early Career (EC) scientists in the HWO TAG. This is in the plans. Dr. Clampin suggested that APAC request TAG updates at future meetings.

Dr. Hickox asked about an IDEA consultant providing detail on leveraging the pertinent resources to the teams of missions in development and operations. Dr. Clampin said that where centers run the programs, they provide that. Where there is no center lead, APD can talk to the group running the program about providing this. Dr. Daniela Calzetti said that regarding IDEA IPs, she heard that there was some confusion about the feedback and a disconnect between what was requested and what was provided. Dr.

Cucchiara replied that the emphasis is on an inclusive environment at this point. There is some difficulty in distinguishing between inclusion and diversity, and APD will differentiate that better in future call language. APD is learning along with the community. However, inclusion is a NASA core value that APD embraces. There is a danger in over-describing for the proposers, which means there is a grey area.

Dr. Shardha Jogee pointed out that laws are changing to preclude Diversity, Equity, and Inclusion (DEI) at universities, so many campuses have constraints. The language needs to reflect language what can and cannot be used. Dr. Cucchiara said that NASA is aware of this and the language for ROSES-23 emphasizes safe and inclusive environments rather than diversity. SMD will not ask proposers to discuss things that are not allowed. Evaluators will have the appropriate guidance in this area.

Discussion

Dr. Holley-Bockelmann led the APAC discussion of the budget and recommendations. Dr. Tremblay said that the PBR had the Great Observatories Mission and Technology Maturation Program (GOMAP) in Cosmic Origins (COR) Supporting Research and Technology (SR&T). He asked if there is a push to get it as a line item. Dr. Clampin replied that GOMAP is only a part of COR SR&T, not the whole thing. FY24 will ideally fund some of this, but not at the levels of DS recommendations. There is enough to move it forward, however. The fellows have not been moved; they are in the Hubble budget. Dr. Calzetti said that it would be helpful to learn how APAC can provide more assistance, given the sparsity of detail allowed on the budget. Dr. Clampin said that there is much uncertainty, but advice on the priorities he highlighted would be very helpful. He has tried to maintain a balance without shaving off percentages indiscriminately. He wants a strong R&A program and a thriving community, especially among EC scientists.

Dr. Gaskin noted that some things need to start sooner rather than later, so timeframes would be useful. Dr. Clampin said that he has begun talking with the HST and Chandra teams. There are great things going on in astrophysics. JWST is doing great, the XRISM team made a lot of personal sacrifice to move forward, and SPHEREx and others are moving ahead. APD is doing great science and will have to make some hard choices. Dr. Hickox asked if he saw a tipping point where HST and Chandra support could end. They are aging and there could be catastrophic problems, but ending them due to lack of funding would be awful for the community. Dr. Clampin said that he did not believe they were near tipping points, but the mini-SR will discuss this.

Dr. Holley-Bockelmann asked about Transform to Open Science (TOPS) funding. Dr. Clampin said that that is budgeted at the SMD level. Each division contributes and has different activities. It is unlikely that SMD will provide additional support. Dr. Jogee had three points. First, she observed that a lot of students get funding through HST, which could be affected by cuts. Dr. Clampin said that there will be slight increases in the fellowship program. APD has asked HST to look at the best way to work with the numbers they have been given, with trades for operations versus grants. Dr. Jogee next asked how APAC and the community can help, and if there is a mechanism for community input. Dr. Clampin replied that APD is seeking high-level commentary on a big picture approach. Input on individual programs does not help given the way budgets work. The need is for balance. Finally, Dr. Jogee asked about the mechanism for lobbying by the science community. Dr. Clampin said that NASA is not allowed to do that. He gets requests to brief Congressional staff on what APD is doing and the budget, and he interacts with the Office of Management and Budget (OMB). APD can provide information but cannot advocate or lobby.

Dr. Mark Mozena asked if there is an example of a legacy mission that changed its funding model. Dr. Clampin said that there have been international partners, and some missions transition to private operations. It is probably a policy issue for SMD. Dr. Ilaria Pascucci said that a way for the community to connect is through the Program Analysis Groups (PAGs), which provide findings and connect to the community. While acknowledging a conflict on Chandra, Dr. Tremblay noted that these proposed cuts

can be painful and add risk to two of our last Great Observatories that are still doing world-class science. He added that the committee and the community does respect and sympathize with the difficult position Dr. Clampin is in with respect to the fiscal environment, and it understands that Dr. Clampin and SMD cannot print money. He wanted to confirm that protecting Roman's cost and schedule was Dr. Clampin's top priority. Dr. Clampin confirmed that yes, it is. Dr. Tremblay then asked if, for JWST, the \$30 million added to the Guest Observer (GO) program is considered part of the prime mission budget and not "extra". Dr. Clampin confirmed that he'd guess it is considered part of the prime mission. Dr. Shirley Ho asked about future AI initiatives. Dr. Clampin said that that will be a factor with Roman, and R&A will look at the use of AI to get new science capabilities. This is in the early stages. SMD is looking at updating the guidelines, which go back to 2018.

Dr. Holley-Bockelmann pointed out that APAC members hear from the community and have received a lot of input about recent comments regarding Chandra's performance. APAC hears that it is still strong functionally and scientifically. Dr. Clampin agreed, but said that it does have an issue with some degradation that requires management to prevent overheating. The SR noted this and said it was a tradeoff. It makes it harder to schedule science.

Dr. Holley-Bockelmann noted that the APAC recommendation to hear about LGBTQI support has been made twice since the JWST naming report. There are supposed to be special emphasis programs at NASA and these are very hard to find. It is easy to set these concerns aside when NASA is in budget battles, but setting aside something this simple is a failure. When APAC makes recommendations, it is for a purpose, because the members have heard from the community or they feel very strongly about something. This is important and it is low-hanging fruit to do a report. When the Committee asks for this kind of thing, they want it taken seriously. Dr. Clampin said that he appreciates this. He was at a TDAMM meeting where this came up. APD takes this recommendation seriously and wants to expand this across all the subgroups. They look at all the different axes. Dr. Holley-Bockelman emphasized that the point was that APAC asked for it for LGBTQI twice. They want this group to be addressed specifically.

ExoPAG/PhysPAG/COPAG Updates

The PAG chairs provided updates.

ExoPAG

Dr. Pascucci, Chair of the Exoplanet PAG (ExoPAG), described the PAG's scope and presented its Terms of Reference (TOR). She listed meetings and activities that had occurred since the previous APAC meeting. These included the ExoPAG 28 meeting, which was meant to strengthen connections between the astrophysics and planetary science communities in exoplanet science. Attendance was not what was anticipated, which the PAG will work on for future meetings.

At the ExoPAG 28 business meeting, there was a finding related to novel whole-disk observations of solar system worlds that could benefit HWO. There was also discussion of two new SAGs, on Exoplanet Reflectance Spectroscopy relevant for HWO, which will likely be presented at the next APAC meeting, and on Technosignatures, to be presented at the American Astronomical Society (AAS) meeting in January. The business meeting also discussed the need for targeted funding to promote collaboration across disciplines.

Also, since the last APAC meeting, there were SAG and SIG meetings for cross-PAG groups addressing new great observatories, TDAMM, and equity issues. Dr. Pascucci updated the status of the ExoExplorers Science Series, sponsored by the ExoPAG Executive Committee and NASA's Exoplanet Exploration Program in order to support professional development of graduate students and postdocs in exoplanet research. The steering and organizing committees are soliciting feedback in order to better tailor the

program to participant needs. A bar graph showed an example of the results of changes made in response to feedback.

Dr. Pascucci reported on the activities of the active SAGs and SIGs. SIG 2, Exoplanet Demographics, is recruiting new members and is looking at open questions and ongoing activities for the community. SIG 3, Exoplanets Solar System Synergies, has been gathering community input, expanding communications, providing tutorials, and planning a review paper. SAG 23, which addresses the impact of exo-zodiacal dust on exoplanet direct imaging surveys, held a workshop. Finally, SAG 24, the new SAG on starshade observations, has defined its goals.

Dr. Pascucci next presented a response from Drs. Robert McMillan and Renu Malhorta to NASA's Request for Information (RFI) on increasing access to NASA-supported research. The response discussed several points, three of which were specifically cited: how sharing software can discourage innovation; the corruption of scientific investigation that can result from shared software; and, the impact that shared software has on competition. ExoPAG would like APAC to discuss these concerns at a future meeting.

Dr. Kiessling asked for clarification on the new policy about starting SIGs and SAGs. Dr. Pascucci explained that the ExoPAG EC is working on a document summarizing how SIGs and SAGs are created; in the document there is no mention of the interaction with the HWO START team as SIGs and SAGs pre-date the formation of START. Dr. Clampin suggested holding this for another time. Dr. Hickox asked how other science communities and PAGs might learn from the ExoExplorers program. Dr. Pascucci suggested that the chairs of other PAGs contact the ExoPAG chair, and observed that other communities seem to be working on programs with similar components. Dr. Gary Blackwood of APD's Exoplanet Exploration Program explained that ExoExplorers started off as a pilot program. It would be very easy to share its lessons learned with other communities. Another program is aimed at a different stage of student careers, and he would be glad to provide a briefing along with the officers involved in the other program. Dr. Holley-Bockelmann liked that idea. She also wondered about cost, which Dr. Blackwood said he could discuss in a presentation. Dr. Pascucci added that the ExoPAG EC advertises this program at every ExoPAG meeting and tries to support the participation of early-career scientists at PAG meetings.

PhysPAG

Dr. Justin Finke, chair of the Physics of the Cosmos PAG (PhysPAG), explained that the PAG covers a very broad set of topics, which he listed. He also listed the Physics of the Cosmos (PhysCOS) staff at NASA and the members of the PhysPAG executive committee. The PAG has seven SIGs. Dr. Finke noted the four SAGs: Gamma-ray Transient Network (GTN), which recently concluded and delivered its report;; New Great Observatories (NGO), which is a cross-PAG; Astrophysics with Equity, Surmounting Obstacles to Membership (AWESOM), also cross-PAG; and TDAMM Communications (TDAMMCOM), which is new. At this meeting, he planned to propose a new SAG on Future Innovations in Gamma-ray Science (FIGS).

PhysPAG plans to meet the Sunday before the January AAS meeting. A current activity is identifying science gaps, which the PAG would like to do every 1 or 2 years. Response has been less than hoped because people are busy. Dr. Finke presented recent activities of the X-ray and Gamma-ray SIGs, and plans for the kickoff meeting of the TDAMM SIG. The AWESOM SAG work is continuing via virtual meetings, with a complete report expected in early to mid-2024. He noted that the slide was incorrect; the next meeting was scheduled for October 23. He also gave the status of the TDAMMCOM SAG. APAC members had already seen the Terms of Reference (TOR) for the FIGS SAG, and he was seeking Committee approval. He briefly reviewed the TOR and presented a proposed timeline, adding that the gamma-ray community is very interested in this. He then summarized the presentation, adding that the PhysPAG executive committee meets every 2 weeks.

Drs. Holley-Bockelmann and Hickox asked for more detail on how the proposed FIGS SAG differs from other groups, such as the Gamma-ray SIG. Dr. Finke explained that the latter is an ongoing group. The FIG SAG will focus on answering what science is not being done with NASA's current fleet of GR missions and what is needed in the future. Dr. Kiessling spoke up in support of the SAG and said she thought the TOR covered everything. Dr. Holley-Bockelmann asked if it were a renaming of the Drivers of Future Gamma-ray Astrophysics (DFGA) SAG; Dr. Finke confirmed that it was. Dr. Joguee asked how the input is synthesized, and whether these are short- or long-term groups. Dr. Finke replied that the seven SIGs are longstanding, permanent groups that get input from the community to provide to the PhysPAG executive committee. That input then filters up to NASA and APAC. SAGs are short-term, producing a report to NASA and APAC.

COPAG

Dr. Shouleh Nikzad, chair of the Cosmic Origins PAG (COPAG), gave the final PAG update. Currently, the PAG has two Science and Technology Interest Groups (STIGs) for InfraRed (IR) and for UV/Visible, as well as three active SIGs, for Galaxies, Stars, and Active Galactic Nucleus (AGN). These mirror the DS panels. A new SIG, on Diffuse Gas in Cosmic Ecosystems (DGCE), has formed and initiated activities. The Executive Committee meets every other week and speaks with NASA staff in the interim.

COPAG has a number of community engagement activities in progress, with plans for AAS splinter sessions, a joint PAG session, and booths. The astronomy community needs to come together for HWO, so the joint PAG meeting will be particularly important. COPAG is also looking into having a community town hall and a series of cross-PAG workshops on HWO.

COPAG began working on science gap activities in the Stars and Galaxies SIGs in January 2023. In conjunction with the Cosmic Origins (COR) staff in APD, COPAG is working on soliciting community input on precursor science gaps. There was a leadership turnover in the IRSTIG, which is planning activities for AAS. UVSTIG is also making plans for AAS and was having a seminar on photothermal UV detectors at the same time as this APAC meeting. The Galaxies SIG recently began a series of monthly seminars, and recordings are available on the SIG's events page. The new DGCE SIG has talks every month that are well-attended; the recordings are available and regularly viewed.

The UV Working Group is developing a technology white paper on the scientific motivation for UV observations using HWO, and the status of UV technology that will be crucial to HWO, with emphasis on the development necessary to reach notional requirements. This activity began because the community wanted to continue some of the work that led up to the DS. The goal is to have a roadmap; the white paper will be presented at the AAS meeting in January 2024.

The COPAG strategic plan was completed over the summer, with the goals of guiding the PAG's activities over the next 5 years and ensuring that the many community participants are using their time toward productive ends. The plan has been presented to APD, which concurred. There is a strategic framework that delineates the mission, goals, vision, and values of COPAG. Dr. Nikzad gave an example of a goal, with strategic objectives, assignments, and timelines. The document was developed with the help of a facilitator, as recommended by Dr. Manuel Bautista of APD. Dr. Nikzad explained that COPAG sought a document that could be turned over to successive executive committees. She noted that a concern was learning what the community finds important that is missing. When such items were listed, the team saw patterns and identified areas where NASA and the community can move forward together.

NASA Astrobiology Program

Dr. David Grinspoon, NASA's Senior Scientist for Astrobiology Strategy, explained that his is a new position and the astrobiology program is structured a bit differently from other NASA science programs. He gave his background, much of which has been in planetary and exoplanet science and includes a great

deal of interdisciplinary work, as well as outreach and education. He is the first to hold the Blumberg Chair, which a NASA astrobiology program sponsored in partnership with the Library of Congress as an interface between science and the humanities. Dr. Grinspoon showed the new organizational chart for the program and noted that he will be working to expand and formalize connections across SMD divisions. He also intends to do more work with other institutions, government agencies, and international partners. The discipline has been, and remains, housed in the Planetary Science Division (PSD), where the Astrobiology program scientist will focus on internal efforts, while the deputy program scientist will be more oriented to external efforts.

The recent delivery to Earth of asteroid samples collected by the Origins, Spectral Interpretation, Resource Identification, and Security – Regolith Explorer (OSIRIS-REx) is of interest to astrobiologists. It will be a while before these samples can be studied. In the mean time, atmospheric composition data from JWST's look at K2-18b, an exoplanet, provide indicators associated with life, possibly even water. In addition, while data come in from NASA's ongoing Mars exploration, the Europa Clipper mission will use the same boosters as the Psyche mission.

Future directions include increased cross-divisional and cross-directorate activity at NASA. There is a logic behind the SMD division structure, but the need for cross-cutting science is growing so that NASA can address new opportunities and new information. Dr. Grinspoon described some of the potential for more projects and partnerships outside of NASA. All in all, there is a lot of opportunity to add astrobiology to various missions. In addition, there will be discoveries relevant to astrobiology, and these present communications challenges for both the scientific community and the public. Science is never done even when it reaches a goal. There are ethical issues as well.

An example of possible inter-divisional research asks if Venus was ever habitable. This research can apply tools from Earth science and data from planetary and heliophysics, for example. It becomes a difficult problem because it involves testing the limits and capabilities of models. However, it has implications for Earth and for exoplanets. The result, which implies that a habitable planet can be closer to a star than previously assumed, is tentative and will depend on future Venus missions.

The JWST detection of dimethyl sulfide on an exoplanet is an example of communications challenges, raising issues of how to report discoveries of potential biosignatures. If there are more such discoveries, there is the pitfall of looking like the investigators are announcing the same thing repeatedly when, in fact, there is a series of discoveries. The Astrobiology program now has a standard of evidence report framed as a progression through incremental questions. For example, the dimethyl sulfide discovery is between the questions asking if there has been an authentic signal detection and whether that signal has been adequately identified. This is an active area of discussion and a February workshop will invite journalists and communicators to address it. The Astrobiology program cannot control what is written by others, but it can communicate consistently and well.

Finally, the astrobiology strategy needs to be updated, as it has been a decade since the previous one and much has happened in that time. The program will seek input and help from the astrobiology community, possibly looking beyond the 10-year timeframe. Key questions include what the science will look like and what new tools and techniques scientists will have at their disposal.

Dr. Gaskin thanked Dr. Grinspoon and asked about the area of technology development. Dr. Grinspoon replied that there are some technology development programs, mostly within PSD but across SMD. APD's work on detectors would apply. Dr. Holley-Bockelmann explained that developers need to know and understand the science better in order to determine if their work is applicable. She advised pairing scientists and technology developers. There are barriers that do not need to exist here, and it would be interesting to see a new way to bring these people together. All of the SMD divisions can do this better.

Dr. Grinspoon said that he is still learning but was making a note to talk to the SMD R&A people. Dr. Holley-Bockelmann reiterated that the right people are not getting together, which is important here, so a key question is how to make that work.

Public Comment Period

The meeting was opened for public comment. Dr. Malhorta, whose input on software sharing was presented during the ExoPAG update, stated that she is a professor at the University of Arizona. The proposed policy on software sharing would place a high burden on smaller groups and take resources away from research. Further, it was not clear what existing problem would be solved by this policy. Dr. Clampin said he would take the comments to SMD to open a discussion on this point, adding that there have been other comments. The general idea is to enable maximum inclusion of the science community, but Dr. Malhorta made a good point. He would seek clarification on the level of documentation expected, and acknowledged that Dr. Malhorta had provided a longer version of her concerns.

Dr. Holley-Bockelmann began reading comments submitted to the public portal. First was a question about the delayed approval of the student SIG, which had been discussed at the two previous APAC meetings. Dr. Holley-Bockelmann said that she understood this to be an idea that is still being formed. If the student SIG is ready for APAC approval, the organizers should let APAC know. Dr. Nikzad explained that a TOR had been developed and was currently under review. A lot of work had gone into it and the goal was to present it at the next APAC meeting. Dr. Holley-Bockelmann said that if a group wants to study something, she is happy to support them.


Next was a question about the timing for the release of the Astrophysics Data Analysis Program (ADAP) results. Dr. Clampin explained that APD will release these by the end of October. Some programs are running late in releasing their results, but preparation for a possible shutdown has taken some time.

Dr. Hickox read a question that asked if a broader science community evaluation should take place before NASA makes cuts to successful missions like Hubble and Chandra. Dr. Clampin explained that there is not time for this in the budget cycle, as APD must respond quickly to some requests and full SRs involve more planning.

GPRAMA Overview

Ms. Jennifer Kearns of SMD introduced the Government Performance and Results Act (GPRA) Modernization Act (GPRAMA) review. This Act requires each Federal entity to provide a strategic plan, an annual performance plan, and an annual performance report to evaluate progress made in key areas. In SMD, many performance measures address milestones for missions in formulation and development. There are also measures of science progress, the nine Performance Goals (PGs), which are reviewed by external experts, typically the advisory committees for each SMD division. For each of the PGs, one division's committee leads the review, with additional input from the committees of designated divisions.

Table 1

PERFORMANCE GOALS	APAC	ESAC	HPAC	PAC	BPSAC
1.1.1 NASA shall demonstrate progress in characterizing the behavior of the Earth system, including its various components and the naturally-occurring and human-induced forcings that act upon it.					

1.1.2	NASA shall demonstrate progress in enhancing understanding of the interacting processes that control the behavior of the Earth system, and in utilizing the enhanced knowledge to improve predictive capability.					
1.2.1	NASA shall demonstrate progress in exploring and advancing understanding of the physical processes and connections of the Sun, space, and planetary environments throughout the Solar System.					
1.2.2	NASA shall demonstrate progress in exploring and probing the origin, evolution, and destiny of the galaxies, stars, and planets that make up the Universe.					
1.2.3	NASA shall demonstrate progress in exploring, observing, and understanding objects in the Solar System in order to understand how they formed, operate, interact, and evolve.					
1.2.4	NASA shall demonstrate progress in discovering and studying planets around other stars.					
1.2.5	NASA shall demonstrate progress in improving understanding of the origin and evolution of life on Earth to guide the search for life elsewhere, exploring and finding locations where life could have existed or could exist today, and exploring whether planets around other stars could harbor life.					
1.2.6	NASA shall demonstrate progress in developing the capability to detect and knowledge to predict extreme conditions in space to protect life and society and to safeguard human and robotic explorers beyond Earth.					
1.2.7	NASA shall demonstrate progress in identifying, characterizing, and predicting objects in the Solar System that pose threats to Earth or offer resources for human exploration.					
1.2.8	NASA shall demonstrate progress in understanding the properties of physical and biological systems in spaceflight environments to advance scientific knowledge, enable space exploration, and benefit life on Earth.					

Table 1, above, shows the leading (green) and supporting (yellow) contributors.

SMD asks the advisory committees to evaluate the previous year’s science progress, and identify examples on which the committee’s rating is based. To that end, Dr. Hasan had sent APAC members a document with items that they could consider, though they were not restricted to using those examples and could add items they found on their own. A NASA team will synthesize APAC’s examples for the final report. The evaluation is intended to be relatively high level, not comprehensive. APAC was to consider whether the examples indicate a clear advancement of the previously existing body of knowledge and resulted at least in part from NASA-funded efforts and/or data . Results published in peer-reviewed literature were strongly preferred. Ms. Kearns emphasized that the review is intended to be objective and not advocacy.

Key to the GPRAMA evaluations are the color ratings:

- GREEN: Expectations for the research program fully met or exceeded in the context of 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.

To support the development of the Annual Performance Report, SMD requests that the committee identify the top results (or shortfalls)- on which each rating is based, and, if possible, for each PG, an image or two corresponding to key results. Ms. Kearns thanked APAC for their work on this and said she would be available to answer questions.

Dr. Holley-Bockelmann asked how much space SMD wanted these to take. Ms. Kearns explained that in 2022, SMD published about three long paragraphs for each PG. Different divisions have taken different approaches. One option was to highlight one result per paragraph, while another is to group types of results by paragraph, with less detail on each. Links are very helpful regardless. Dr. Hasan had sent the 2022 report to APAC members. It was also important to note that the primary audience for GPRAMA is the public and Congress, so the examples should be written for the intelligent layperson rather than experts.

Dr. Joguee wondered if it might be more useful to present data on the missions. Dr. Hasan replied that this is for the public and SMD wanted to show specific examples the public could understand easily. Dr. Joguee thought that the two approaches could be combined. She believed the public would understand the magnitude of the work in addition to examples. Dr. Hasan explained that the format is more or less set. Ms. Kearns added that SMD had tried using some different measures in the past that were found to be unnecessarily labor intensive, and stakeholders favored the external experts' review of specific results. SMD reviews the approach periodically and will do so again, but the format is set for this year. Dr. Joguee was concerned about the quality of the review but agreed that having links would be useful. Dr. Hickox observed that when APAC looks at the ratings, they are assessing the global program of NASA APD and illustrating that program, thus making a statement about the whole program. Ms. Kearns agreed, again noting that the input from APD is meant as a starting point. Dr. Hamden stated that she disagreed with Dr. Joguee. The people reading this will not know how citations matter or what goes into publishing, so keeping this understandable for the public is important.

GPRAMA Discussion

Dr. Holley-Bockelmann suggested that APAC vote on the color ratings first, then select examples. Members would need to do some off-line writing and editing in preparation for the next day. There were also cross-cutting items and guests providing input from the committees for other divisions.

APAC first voted on Performance Goal 1.2.2: "NASA shall demonstrate progress in exploring and probing the origin, evolution, and destiny of the galaxies, stars, and planets that make up the Universe." The Committee was unanimous in voting for a Green rating.

Next, APAC voted on Performance Goal 1.2.4: "NASA shall demonstrate progress in discovering and studying planets around other stars." The Committee was again unanimous in voting for a Green rating.

Dr. Tyler Robinson represented the Planetary Science Advisory Committee (PAC), which had provided a number of examples for APAC to consider for PG 1.2.2. Of these, Dr. Robinson thought the best item for this review was "Sun formed in a stellar cluster," which addressed Scattered Disk Objects (SDOs). This result used data from a collaboration between APD and PSD. It also involved Department of Energy (DOE) resources and was supported by NASA's Emerging Worlds Program.

For PG 1.2.4, Dr. Robinson had suggested five examples. His favorite for the review was “Rocky exoplanet TRAPPIST-1 c likely has a thin atmosphere.” JWST was involved in this one and it is an example of planetary science coming from an APD resource. Dr. Holley-Bockelmann said that APAC would consider these.

Dr. Aroh Barjatya represented the Heliophysics Advisory Committee (HPAC). He had made recommendations for both PGs but strongly recommended “The Great Dimming of Betelgeuse: A Surface Mass Ejection and Its Consequences” for PG 1.2.2. Part of his rationale behind this suggestion was that the public is fascinated by this phenomenon. In addition, it directly speaks to 1.2.2.

Dr. Holley-Bockelmann thanked Drs. Robinson and Barjatya for their advice and said that APAC might send them questions off-line.

She explained that APAC could examine gaps after some triage of the APD list. It was agreed to select three or four APD examples for each of the two PGs. While discussing which examples to include, Dr. Gaskin observed that there is value in highlighting the full span of NASA missions, showing a portfolio with great reach. She wanted to show a cross-section of science. Dr. Hasan said that she made the list from a science perspective. After other APAC members weighed in, it was agreed to select the science. There was some debate about the example “Peekaboo! Tiny, Hidden Galaxy Provides a Peek Into the Past,” which ultimately did not make the cut. The inclusion of HPAC’s Betelgeuse example was considered. APAC decided against using the PAC recommendation about a sun formed in a stellar cluster because it was largely a DOE effort. Dr. Holley-Bockelmann provided a link to a Chandra result in the WebEx chat box. (<https://chandra.harvard.edu/photo/2023/tde/>) There was also debate about TRAPPIST and IXPE examples, plus on a Swift and Fermi result having to do with a cosmic blast. The working list that APAC developed included the following:

- Early Universe Mash-up
- Webb Snaps Highly Detailed Infrared Image of Actively Forming Stars
- Brightest of All Time
- NASA’s IXPE Helps Solve Black Hole Jet Mystery
- The Great Dimming of Betelgeuse: A Surface Mass Ejection and Its Consequences

For PG 1.2.4, Dr. Pascucci suggested a result not on the list, the JWST discovery of methane and CO₂ in the atmosphere of K2-18 b. There was debate as to whether it was too speculative. Dr. Hickox persuaded the other members that it could be combined in a broader example of Webb’s efforts to study and characterize atmospheres. Another candidate was an HST result having to do with an evaporating planet, and there was some interest in a discovery by HST and Spitzer that two exoplanets could be mostly water. As Kepler was winding down, a result with a big citizen science element was considered, with the intent that it could be combined with something else. The PAC TRAPPIST recommendation was another candidate for merging. Dr. Joglee wanted to include a result on a massive black hole that is brighter than most models predict and has sparked debate. The working list included the following:

- Planetary Atmosphere Mashup
- Astronomers Discover Planets in NASA Kepler's Final Days of Observations + NASA’s TESS Discovers Planetary System’s Second Earth-Size World
- Rejuvenating Stars with Planets

It was agreed to make each of these one or two paragraphs long, with links and images.

Wrap up for Day 1

In summarizing, Dr. Hickox said that the budget was important and APAC would have to think carefully about the APD criteria for setting priorities. Dr. Caputo added that they would need to vote on the FIGS

SAG. Dr. Tremblay noted that there have been a large number of SAGs created recently, and that while in general he was totally on board with the community being allowed to study and analyze whatever it wants, he wondered whether APD viewed this as a problem. Dr. Clampin said this was a good question but he is not yet concerned as they are not to the point of information overload. Dr. Gaskin added that the SAGs are about more than reports, because they bring EC scientists into involvement and leadership. That training is hard to get. Dr. Kiessling said that it is important to get all those voices into the room. Dr. Jooe was more concerned about whether the inputs from the SIGs is being sufficiently channeled. She wants them to receive the proper attention.

Dr. Clampin added that there is a misunderstanding about START. There is not going to be a new process, but it would be good to let START and TAG have their team meetings first. If there are new SAGs that get ahead of START, that could be counterproductive.

Dr. Holley-Bockelmann thanked everyone for their participation and adjourned the meeting for the day at 4:47 p.m.

Friday, October 20

Opening Remarks

Dr. Hasan opened the meeting and reminded participants of the FACA requirements. There was to be a public comment period. APAC members should recuse themselves in the event of a COI. Drs. Kiessling and Caputo had identified COIs with Roman. Dr. Holley-Bockelmann then introduced the first speaker, Dr. Julie McEnery, Senior Project Scientist for Roman.

Roman Update

Dr. McEnery began by showing the project schedule. The team continues to work toward a launch readiness date of October 2026. The Wide Field Instrument (WFI) and coronagraph instrument integration is now complete, and the Optical Telescope Assembly (OTA) is nearing completion. The spacecraft is in the integration process, and element delivery to Goddard Space Flight Center (GSFC) will occur in mid-2024. Exterior elements are on the schedule for integration in 2025. Dr. McEnery showed some photographs of the work in progress. She then discussed slew and settle time. An updated mass estimate and moment of inertia estimate now allow the team to stop holding so much margin. Having real hardware provides a better sense of how things will actually work. This means they should be able to run the reaction wheels at full power. Similarly, the detector array is proving to be better than the standards set by the Design Reference Mission (DRM). The instrument carrier has been delivered to GSFC as well.

The WFI is in thermal vac testing through early November. Testing will be repeated in 2024 along with additional tests for risk reduction. This will provide detail on the calibration of filters and detector array as a function of the field angle, and add more information on the coating variation over filter surfaces. At the Jet Propulsion Lab (JPL), the team is running a full functional test of system-level functionality, with testing of hardware and its interactions with software. Resulting test procedures will be used in subsequent testing. The coronagraph instrument is on track for delivery with full testing of the required observing mode. A timeline puts it at GSFC for integration in May. The basic aim is to stay off the Roman critical path.

The Threshold Technical Requirement (TTR5) requires only band 1, which is achievable with threshold technology and will produce a somewhat modest science return. However, the band 1 performance is likely to exceed the requirement. While the mission team wants to manage expectations in regard to threshold requirements, with TTR5 being full success, it is also preparing for better performance. This leads to the Coronagraph Community Participation Program (CCPP), a group of people who will help the

team reach TTR5 and move a bit further. One of Dr. McEnery's colleagues explained that the band 2 information on the chart is the lowest priority of the various goal modes, but the hardware is installed. For band 2, there are no strong absorption features in colder planets. As a technology demonstration, the team had to set priorities. Dr. Tremblay asked for clarification on the spectroscopy requirement. He was told that there is no spectroscopy requirement at all, but the is to exceed better than 10 to minus 7. Thermal vac testing will help define this better early next year.

Dr. McEnery said that the Roman team would like APAC guidance on how they engage the community, since it has changed from the original plans. The team might want explicit feedback at future meetings. The community process to define the three core community surveys is well underway. An early definition survey option would allow the community to provide input into a survey involving another section of the community. The community science, technology, and infrastructure teams have been selected after the initial set of teams was disbanded. This has resulted in a dramatic increase in enthusiasm. It includes selection of a TDAMM infrastructure team. Regarding continuity between the first set of teams and the new ones, Dr. McEnery explained that some overlap was inevitable since the groups were large, but now more EC scientists are involved in leadership. Documentation of the previous teams' efforts ensures that their work was not wasted. Most Roman observations will be primary data sets for multiple science communities working in collaboration, and this intellectual collaboration will be led by the community. The plan is to add survey definition working groups. The CCPP team is larger than the ROSES selection due to international partners. Dr. McEnery also noted plans for conferences and workshops.

The Roman data volume will be enormous and the team is already grappling with this. A graphic illustrated just how much larger it will be compared to HST and JWST. Even the Integration and Testing (I&T) process will generate unprecedented amounts of data. The community will need to understand that the data volume will involve time constraints and other issues that they have not encountered previously. This is another area for which the Roman team would like APAC input at future meetings.

Dr. Tremblay asked if this is modeled after the Rubin Observatory data platform, which is in the cloud. Dr. McEnery replied that the question is whether the science platform will support the science that people want to do, but Rubin will help the Roman team and the community learn. Dr. Hickox asked if they had considered an explicit activity looking at Rubin or other distributed cloud-based analysis, and how to apply it. Dr. McEnery said that the team has reasonably good connections with Rubin. The general area of platforms is a hot topic now. Dr. Mozena noted that the Earth imaging side and the commercial side both have and address large data challenges. Dr. McEnery said that Roman is looking at this as well. One of the challenges is that NASA has a more open data policy. Dr. Mozena added that the Earth science community has been dealing with this at the SMD level, and the National Oceanic and Atmospheric Administration (NOAA) also has initiatives. Dr. McEnery said that Roman will not use DSN for downlinking, just to send commands; Roman will have dedicated antennae. Dr. Holley-Bockelmann observed that Rubin did data previews, and she wondered if the data volume preview or I&T archive could be test beds. Dr. McEnery said that the latter would not be that useful, but they could explore trying to enable the science platform for use in simulations.

The core community survey definition process will help determine who needs to be involved. The team received more than 130 science pitches, which provided an easy way for scientists to engage and present their ideas. This led to a white paper call seeking more detail and discussion of needs and trades. There were some collaborations here. Finally, having received self-nominations, the team is forming survey definition committees. Dr. McEnery gave a timeline for the core community survey definition. Rebooting the science teams has been beneficial and resulted in many AI/machine learning (ML) proposals. Some of these address calibration, and some are in new areas. There are more EC PIs involved now, and the mission has two sizes of awards to facilitate this. The goal is to have multiple entry points.

Roman was not designed as a TDAMM mission, but the hardware is capable of that science. What was missing was the pipeline and processing infrastructure. A TDAMM infrastructure team is now addressing this, and the mission team seeks greater community input as to whether the efforts meet their needs. The mission team is not as far along with the CCPP. The goal is to have it be a conduit for coronagraph activities. Current work on a collaboration agreement will lead to a CCPP climate committee, while ongoing spin-up of topical working groups should result in broader community engagement.

Dr. McEnery closed by presenting a timeline.

Habitable Worlds Observatory Update

Dr. Shawn Domagal-Goldman, HWO Program Scientist, explained that this mission will follow Roman as the next great observatory. It will study the lifecycle of galaxies, look into the properties of dark matter with dwarf galaxies, expand the search for life beyond our solar system, and provide greater depth to the exploration of exoplanet properties. Decades of research on NASA's flagship science missions have led to the conclusion that there is a need for focused technologies to achieve scope. Therefore, the HWO team must identify the architectures needed to achieve its goals without scope creep. This goes beyond APD to planetary science, which has important lessons learned. The conclusion is that "evolution not revolution" will make for reliable technologies. Part of this involves looking at how the next generation of launch vehicle options affect design and other technology areas. Another consideration is robotic servicing. The mission will need margins in order to address problems and avoid programmatic issues. NASA will reduce risk by fully maturing the technologies prior to the development phase.

The HWO mission team will involve the community in setting up its START. The astrophysics and planetary DSEs will be foundational, and the START and TAG can do preliminary analyses so the project office does not have to wait. The mission team also wants the START to think about mentoring and the academic community. The START selection process began with the appointment of co-chairs. Dr. Domagal-Goldman described their leadership expertise and listed member requirements. The co-chairs are leading selection. He noted that he is recused from final selection because he is moving back to GSFC. He then listed the START members. It is a great team representing diverse institutions and disciplines, which should help expand the effort. The TAG will also involve the community. He presented its objectives. There will be industry partners and active mentoring. The Ames Research Center (ARC) and Marshall Space Flight Center (MSFC) are involved. There are four TAG co-chairs, two for science and two for engineering. Dr. Domagal-Goldman noted the expertise required of the co-chairs and members, emphasizing mission experience. He listed the questions the TAG will consider, noting that while cost risks are mentioned, the Group will not look at cost per se. He then listed the TAG membership, which is balanced between GSFC and JPL. A face-to-face meeting for the Roman START and TAG was planned for late October and early November. There are also plans for an HWO splinter session at the AAS. Although the slide indicated that the time was pending, it will be that Wednesday afternoon and will not conflict with the keynote speech.

In discussing community activities, NASA-formed groups, and competed calls, Dr. Domagal-Goldman pointed out that all START and TAG meetings will be open to the extent possible, though International Traffic in Arms Regulations (ITAR) and other considerations could lead to exceptions. Community participation will be key to the function of the working groups. Regarding PAGs, SIGs, and SAGs, it is not NASA's place to tell the PAGs what to do here. The vision is that the working groups will be a good interface, and there is likely to be overlap between them and the SAGs and SIGs. NASA was asking the community to give the teams time to get the working groups running. If a need or desire for a SAG or SIG remains, or if there is a gap or disagreement, the team can deal with it once things are established. However, it is important to minimize work, avoid duplication of effort, and be more collegial. A couple of SAGs are already being set up because people are excited and want to move forward, but time would be

helpful. Dr. Julie Crooke, HWO Program Executive, added that NASA hopes to pay some individuals for their efforts.

Dr. Domagal-Goldman said that IDEA will be a key to HWO's long-term success, and is being incorporated into START and TAG meetings and activities. Emphasis will be on inclusion plans. Dr. Crooke thanked Dr. Domagal-Goldman for his work at NASA headquarters. He replied that he will remain involved at GSFC. Dr. Clampin also thanked him. He urged everyone to watch the previous week's National Academy of Sciences (NAS) presentation on segmented versus monolithic mirrors. It shows why NASA is doing a segmented mirror and why it is the right approach. In addition, the last few months of Space News has promotions from companies that are developing servicing capabilities consistent with HWO needs. Finally, he provided the link to a paper predicting the Coronagraph Instrument (CGI) performance (<https://arxiv.org/pdf/2309.16012.pdf>).

Gamma Ray Transient Network SAG Report

Dr. Eric Burns presented the report from the Gamma-Ray Transient Network (GTN) SAG. The report explains that a priority area in the science community is multi-wavelength electromagnetic observations from space and the ground with non-electromagnetic signals to probe the nature of black holes, neutron stars, and the explosive events and mergers that give rise to them. However, NASA relies heavily on Swift and Fermi for gamma-ray and x-ray work, and these two facilities are aging. At the same time, TDAMM is expected to be a long-term program. Many of the operating and developing missions across NASA and the international science community are glorified Geiger counters with poor localizations. Meanwhile, there is an over-reliance on triangulation, which is imprecise. The InterPlanetary Network (IPN) has been operating as a series of international partnerships since the 1970s and has been the source of major discoveries about the nature of black holes, neutron stars, and their formation. Swift expanded past IPN to provide some remarkable detections. However, it is time to update capabilities in this area.

With the passing of Dr. Kevin Hurley, the long-term IPN leader, Dr. Burns is now in charge and, in seeking inputs for the future, now has the GTN SAG report. Dr. Burns described the TOR, which APAC members had seen. He pointed out that the IPN declined in importance with the launch of Swift. However, it has key capabilities, such as longevity, all-sky coverage, and precise localizations. These may pair well with new facilities at other wavelengths and messengers, especially in the study of rare transients. So the IPN could be part of NASA's solution to the DS TDAMM recommendation.

The GTN SAG report is 69 pages long with a 3-page executive summary. Dr. Burns reviewed the sections. "Sources and Science" covers magnetars, compact mergers, collapsars, and others. More specifically, the magnetars discussion reviews elements and sources related to precise timing, and compact mergers discusses precise localizations. For compact mergers, it is important to note the deep multi-messenger searches with the Laser Interferometer Gravitational Wave Observatory (LIGO). The community needs immediate joint localizations to follow up and meet the full science potential. Collapsars are long-range gamma-ray bursts, the most luminous electromagnetic events, which are detected through afterglow. Non-detections and failures also have values, the latter holding promise as neutrino sources. The field will benefit from the pending operations of the Rubin Observatory. The science community is ready and eager to use the localizations to explore many questions.

Dr. Burns then listed the findings on capabilities requirements, which TDAMM science will need and which are not all currently available. A list of actionable items for the IPN was essentially a wish list, but these items need to be taken into account. A list of actionable items for NASA and its mission teams included enhancement of the astrophysics fleet and gamma-ray instruments on spacecraft from other SMD divisions, a launch of dedicated gamma-ray burst monitors, and greater support for IPN.

Dr. Ho said that this seemed broader than just gamma-ray. Dr. Burns said that some of the National Science Foundation (NSF) discussions were about self-contained groups for data. The GTN SAG would like to do the same for gamma-ray bursts instead of having focus on each individual instrument. Dr. Holley-Bockelmann said that the report, which she read, is comprehensive. Some of the requests seem like low-hanging fruit with high impact, while others are not realistic due to the budget. Dr. Burns thanked her and explained that the SAG wanted to make note of the program recommended in the DS, which is not feasible at present and which means NASA needs to do what it can with smaller-scale investments. Dr. Holley-Bockelmann said that some of the actionable items for missions are already happening, but she understood that communications systems are highly oversubscribed. She asked how big a priority that is for TDAMM. Dr. Burns replied that it is the most critical piece. There has to be attention behind it. Active instruments could be addressed through more ground station time. There are discussions with the Psyche mission, where an option is additional scheduling. It is hard to work within existing architectures.

Dr. Hickox asked if there is a sense of the costs for additional timing capabilities on forthcoming missions with gamma-ray detectors. Dr. Burns said that development of onboard triggers is a flight hardware issue, as is calibration for gamma-ray bursts. He is not that conversant about precision clocks, and a lot of mission teams do not care. There are better clocks that could be bought but that raises the question of power. Dr. Holley-Bockelmann noted that the report refers to pulsar timing arrays. Dr. Burns explained that it is possible to put an X-ray detector on a spacecraft.

Dr. Caputo said that the intentional launch of gamma-ray detectors would be something to discuss broadly with NASA's Heliophysics Division (HPD) and Planetary Science Division (PSD) and that APD should discuss cross division opportunities. Dr. Burns said that this is tricky because adding mass where mass is the main constraint is difficult. Dr. Gaskin agreed that this would need to be in the plans from the beginning through an AO providing an advantage to rideshares and cross-disciplinary work. HPD tried to do cross-disciplinary payloads that did not work out, but APD might learn from that experience. Dr. Burns added that PSD has done something like this.

NASA Hubble Fellowship Program

Dr. Cucchiara now leads the NASA Hubble Fellowship Program (NHFP), taking over from Dr. Patricia Knezek. He listed the members of the NHFP Working Group. The NHFP Fellows are a driving force in the field of astronomy. A history of the program shows that in 2016, APD decided to merge the Hubble, Einstein, and Sagan fellowships into NHFP, retaining the full range of science topics. APAC recommended a review of the merged program to occur every 3 or 4 years. Therefore, an external committee conducted a review in 2021 in order to help increase the effectiveness of the program. The panel report contained 27 findings and 32 recommendations in 5 broad topical areas encompassing mission, management, application and review processes, diversity and accessibility, and support. Two recommendations with fundamental implications address: 1. a new definition of excellence to include teamwork, mentoring, and community-building skills; and, 2. lower barriers to entry. The next step discussed in the report involved socializing the report and development of an implementation plan.

The full report was released to the public in January, 2022, and was followed by ongoing public and community engagement efforts. There will be a special session at the January AAS meeting. The question now is about the status of implementation. NHFP has already enacted many of the report recommendations, which Dr. Cucchiara listed. These include a revised mission statement: *"The NASA Hubble Fellowship Program fosters excellence and inclusive leadership in astrophysics by supporting a diverse group of exceptionally promising and innovative early career astrophysicists."*

The Fellows themselves have been proactive and have launched the NHFP Fellows' Anti-Racism Initiative (FARI). This initiative has already had a number of achievements. In 2023, NHFP Fellows

spearheaded a collaboration with fellows from other programs, including outside NASA, to expand the mentoring program beyond FARI. Dr. Cucchiara closed by describing the future efforts of NHFP.

Dr. Tremblay said that he was an Einstein Fellow some years ago. He thanked everyone involved. Dr. Hamden pointed out that the standard set by this program has been key in raising the salaries of non-prize-winning postdocs, since there cannot be huge disparities within institutions. Dr. Hickox asked about ways to expand the diversity of institutions with Hubble Fellows, most of whom are at a small number of institutions. (Dr. Rita Sambruna stated in the WebEx chat that this is happening.) Dr. Cucchiara said that it comes down to what makes an institution appealing to a fellow, and what resources NASA can provide those who might prefer a smaller institution. The program is working on this and will present it at AAS. There are some good suggestions on where NASA can play a role. Dr. Hickox said that his university has had fellows come close but miss. However, fellows can play a leadership role at smaller institutions, which are benefits that may not be available broadly. Dr. Cucchiara explained that there are host conditions for the fellowships as well.

Dr. Jogee asked how the program assesses diversity among the fellows. Dr. Cucchiara replied that it looks at diversity across all axes. He added that applicants are not required to propose mentoring of students, though an introductory statement notes that this is encouraged. Another question from Dr. Kiessling was about NASA's position on extending the fellowship duration from 3 to 5 years. Dr. Cucchiara said that this seldom comes up, since most fellows receive a faculty offer before the 3-year term is over. The fellows are leaders in the field and the communities want them in their institutions. Dr. Kiessling followed up to ask whether individuals are turning down fellowships because of their short duration. Dr. Cucchiara said that this is currently unknown. Dr. Kiessling suggested asking people declining fellowships if they would share their reasons. Dr. Cucchiara agreed to take this back to the task force.

Dr. Holley-Bockelmann asked about the next set of priorities. Dr. Cucchiara said that those include institutional diversity and the resources required in the face of budget challenges. Another priority is understanding and defining inclusive leadership. The community needs a stronger understanding of inclusion, and to that end, the working group has collected over 200 responses on better understanding what the community needs and wants. Dr. Ho observed that the cost of living might be a reason to turn down a fellowship in a certain part of the country. Dr. Cucchiara said that while there was a cost-of-living increase, there is also a need for balance.

R&A Update

Dr. Stefan Immler, APD R&A Lead, thanked the R&A program officers and provided an update. APD R&A funds about 350 PIs annually at 120 individual institutions. Total awards come to \$130 million. Within this, support is provided to about 600 students each year. Dr. Immler broke out the number of proposals received in FY23 and reported the data for missions, smallsats/cubesats, sounding rockets, and balloons. FY23 was a record-breaking year. Despite high pressure, the selection rate stayed at about 22 percent. Eighty percent of all PIs were notified within 111 days, and the \$130 million in community funding was the greatest amount ever. The program expanded the Inclusion Plan pilot program to six ROSES elements and now uses DAPR in eight ROSES elements. There are almost twice as many R&A program officers as there were 10 years ago.

Pending an FY24 appropriation, the budget charts were tentative. Still under consideration were augmentations to the following programs:

- ADAP, to accommodate analysis of Euclid data;
- Theoretical and Computational Analysis Networks (TCAN), to increase the low selection rate;
- Exoplanets Research Program (XRP), to address DS priorities; and
- CubeSats, to increase funding from \$5 million/year, which is insufficient to meet current costs.

Despite challenges, the budget has grown, as it is foundational. Dr. Immler presented a series of sand charts by program, which included an average 15 percent notional annual growth rate for FY24 through FY28. He pointed out that ISFM, which has grown at about 2 percent, is now a separate funding line. He would provide more detail on FINESST. A series of pie charts broke out funding by institution type. Academic institutions received 62.2 percent. Of those, the top 10 universities received 40 percent of the funding. NASA centers received 28.3 percent, over half of which went to GSFC. Not counting cross-divisional solicitations, there are 18 current astrophysics ROSES solicitations, the greatest number ever.

Dr. Immler turned his attention to the FINESST student research grants. All five SMD divisions participate in FINESST. Recipients often go on to have very successful careers. However, the proposal submission rate has shot up, leading to a corresponding drop in selection rates. Large institutions often submit multiple proposals, which makes a diverse selection of candidates a challenge. An APD R&A working group developed two recommendations:

- Change the solicitation; and/or
- Design a solicitation specific to APD and possibly withdraw from the SMD FINESST program in ROSES-25.

A graph showed the extent to which the submission rate had increased since the start of the pandemic. Submissions have continued to come in at a rate so high as to be unsustainable. This is why APD is considering changes. Another graph showed how APD compares to other divisions. Even though the rates are mostly in line, this is not what APD wants. Each division sets its own FINESST priorities and establishes its own funding and rules. Dr. Gaskin observed that this makes a lower selection rate seem inevitable. Dr. Immler explained that while there could be a shift of funding from elsewhere, the high number of proposals would still be unworkable. It also takes 2 or more years to implement programmatic changes. The institutions submitting large numbers of proposals tend to be large, but it would not be feasible to restrict that due to SMD constraints.

Dr. Immler then discussed the 2023 astrophysics research solicitations. IXPE and XRISM solicitations were added under Data Analysis. He described the new GO Cycle 1 programs for both of those missions. APD R&A maintains a stable PI notification rate, though that could change in the face of a government shutdown. Covid seemed to have no impact on this, and APD compares quite well with other SMD divisions in this area. Bar charts showed the number of proposals, selection rates, and PI notification times by program, from September 2022 to September 2023.

The APD cubesat program is relatively new. The first cubesat, HaloSat, launched in 2018 and reentered in 2021. CUTE launched in 2021 and is still operating. Two cubesats are scheduled to launch in 2024, two more are likely to launch in late 2024/early 2025, and two more are in the pipeline. Because the budget for the cubesats is \$5 million per selection, with one selection annually, and because the actual cost is closer to \$6.7 million, APD has had to shift funds in various ways to compensate.

APD runs the balloon program for all of SMD. This program provides low-cost access to the upper atmosphere with quick response times. Each year, up to a dozen payloads are launched, with participation from more than 40 research institutions and over 300 students. Dr. Immler listed recent and upcoming balloon investigations through mid-2024. Sounding rockets launch from the White Sands Missile Range. There has been some rescheduling, and Dr. Immler pointed out the Cosmic Infrared Background Experiment (CIBER), which will be relaunched in 2024.

There are significant barriers for participation in NASA programs, particularly for EC scientists and those who do not work at large institutions. APD is examining how to address this. One thought has to do with the current requirement that each proposal include a detailed and final budget. The review panels

evaluate level of effort, not budgets. With a 20 percent selection rate, this means that most of these budget submissions will never be seen. Developing the budgets constitutes a particular burden for EC scientists, who might not be familiar with things like indirect cost rates, facility fees, etc. Yet this often-unseen budget adds about a week to the time it takes to prepare a proposal. Therefore, APD will run a pilot program in ROSES-25 ADAP in which it will no longer require full budgets during Phase 1, waiting on that information until after selection at Phase 2.

Dr. Hickox asked if these ADAP proposals will come in through the PIs like observing proposals. Dr. Immler was not sure about institutional involvement. Dr. Tremblay said that he believed most will require it, but this would alleviate so much of a burden. Dr. Gaskin asked about technology development. Dr. Immler said that APD wants to test this on ADAP first before any expansion. The proposals will still have to show level of effort and the program office will be able to judge attempts to wiggle around this. Dr. Gaskin observed that technology development will be trickier. Dr. Immler said he would ask APD to stand up a group to look at how to make it easier. He would like to have a short document that guides proposers through the process. A template might be possible, but it could also be tricky.

Virtual versus in-person reviews are still an issue. He listed the benefits of each and said that APD is thinking of doing in-person reviews at least once every 3 years. Doing more might require some negotiation with SMD. Dr. Hamden said that every other year might be hard. Dr. Gaskin said that the type of proposal could be an issue. Drs. Hamden and Hickox expressed a preference for virtual. Dr. Hickox wondered if the in-person benefits might be creatively supported in other contexts, like attendance at AAS. Dr. Immler said that was a good point. He noted that each program office has an option on how progress reports might be presented. Dr. Ho said she likes face-to-face reviews and would be interested in any effort to quantify the differing quality of the types of reviews. Dr. Immler said that reconsideration requests have not changed from in-person to virtual. APD does think in-person is stronger, however.

Dr. Clampin said that he wanted it to be clear that the budget at the beginning of this presentation was notional, for planning purposes.

NASA Space Communications and Navigation Update

Dr. Jeffrey Hayes, who has held a variety of positions within APD and HPD, explained that he is now transitioning over to the Space Operations Mission Directorate (SOMD) Space Communications and Navigation (SCaN) program, which needs help addressing the science community. He began by describing SCaN's charge in serving NASA's space communications activities. The program currently supports more than 100 missions. The spectrum is becoming far more fraught in the regulatory environment because the government and industry have different modes, including in 5G, where industry wants more of the spectrum. Scientists want data down, while industry can pay for licenses quickly. In addition to DSN, there is the Near Space Network (NSN). Typhoon Mawar took out an antenna in Guam, and this cannot be addressed until NASA has its FY24 budget. This has led SCaN to repurpose an antenna in Australia, which affected DSN. Replacement costs for ground stations would exceed \$50 million.

Dr. Hayes spent some time discussing the challenge of phasing out the Tracking and Data Relay Satellite System (TDRSS). NASA does not have the funds to do this unilaterally, nor is there political or policy support for this. The Air Force is not going in a compatible direction at the moment, and the Department of Defense (DoD) has its own ground stations, in addition to developing in-space stations. OMB wants NASA to move toward commercial solutions. Some of this has led to misconceptions, which Dr. Hayes addressed. For example, a rumor is that SCaN will terminate TDRSS in 2026, but in fact SCaN will maintain it into the 2040s. Also, contrary to the notion that commercial partnerships are new, SCaN has worked with commercial ground providers since 1997. Further, TDRSS is not a dedicated SMD resource, but rather something that NASA shares with other government users. Finally, commercial SATCOM will not be backwards compatible with TDRSS.

Dr. Holley-Bockelmann said that there was an earlier discussion of reducing downlinks, like with Swift. Dr. Hayes explained that the engineering needs to be addressed on that. SCaN is studying and doing demonstrations, and may be able to provide limited back-compatibility between SATCOM and TDRSS. Industry does not use the same band, however. He showed six vendors selected for near-Earth relay demonstrations. They use different frequencies from what NASA has used. The balloon program is already talking about being early adopters here.

Dr. Holley-Bockelmann asked about the impact on enabling TDAMM. Dr. Hayes explained that colleagues have told him that understanding the time requirements will determine the prices. SCaN will work to the science requirements. Dr. Kiessling said that if the budget is not there, the science requirements will suffer. Dr. Hayes said that everyone is constrained. The question is about the tradeoffs, and for that discussion, he needs to know the fundamental science requirements. NASA is aware of the science losses, but the infrastructure is not cheap. Optical communications (Optical Comm) is very different. No one has come up with a standard yet, so it is evolving. SCaN decided to invest in a specific radio in the Ka band. It is small but they can program any waveform and frequency they want. It is a start and there is a need for demonstrations. SCaN will solicit ideas for demonstrations, so those with thoughts on this should let him know. He then presented a depiction of the Wideband Multilingual Terminal.

A graph showed DSN capacity, demand, excess capacity, and spikes due to the Artemis program. The DSN Aperture Enhancement Project (DAEP) is part of the effort to get ahead of this. Dr. Hayes noted that there are issues beyond just cost. Four of the six new antennae are already functioning, and a futures study is looking beyond FY30. SCaN wants input from the community. The missions are responsible for the costs here. Dr. Hickox asked if there could be more antennae in place before Artemis. Dr. Hayes said that would be a good idea but he did not see it happening because of the need for quick Congressional approval. The Artemis budget does not include the ability to talk to Earth from Artemis. Another solution is the DSN Lunar Exploration Upgrades (DLEU), which Dr. Hayes described. He presented the timeline and noted that if Artemis does not use these upgrades, other missions can. Finally, the Lunar Exploration Ground Segment (LEGS) will be a network of antennae and services that will reduce the need Artemis will have for DSN. This will involve pursuing commercial solutions. This all needs to be in place when the Gateway launches.

DSN and TDRSS are in a perfect storm of aging infrastructure and increasing demand, exacerbated by the fact that most governments are reluctant to put money into infrastructure. SCaN is open to discussing ideas as this situation evolves. The program is working on DSN improvement and is trying to help industry understand what science needs. To that end, SCaN needs the astrophysics community, through APAC, to engage and specify its needs and wishes. The community would also help by considering how commercial relay, LEGS, and other new options might fit into future missions. Dr. Clampin added that APAC advice would be helpful in setting priorities. There needs to be a balance between cubesat and flagship communications, for example. Dr. Hayes explained that SMD is also reorganizing in this area. The need is for a rubric that puts the highest priorities in a bin. NASA is trying to sort out where it is going with this. Dr. Clampin remarked that APD is developing an impact package for JWST identifying what is not able to be done as a result of these issues. Dr. Hayes noted that GSFC has also been reorganizing in this area, which increases the need to reengage. NASA's Communications Services Project (CSP) hosts periodic Commercial Services User Group (CSUG) forums that provide more detailed information, which he can discuss offline. He asked everyone to join and give their requirements. This is all rapidly evolving. It is not clear what the back end looks like, and NASA is struggling with what an enterprise architecture looks like. The Agency does not want to get locked in with a vendor that cannot improve or even stay in business. Dr. Mozena said that there is not much coordination, but there are some double payments. Dr. Hayes suggested they talk offline.

Dr. Hayes next addressed the growth in commercial Direct to Earth (DTE) services, with a timeline going back to the 1990s. A graphic showed the impact of Artemis and deep space cubesat support on DSN. This is leading to losses, and NASA cannot keep deferring maintenance. Dr. Gaskin said that there should be solutions via Optical Comm, which has been proven and can be done commercially. Dr. Hayes agreed, but noted that there is some resistance. Dr. Gaskin added that the ground terminals are not that large, and Dr. Clampin agreed. Dr. Gaskin observed that there seems to be lots of investment here. Dr. Hayes said that he envisions doing Optical Comm. While cloud cover can be a factor, the frequency might be a benefit. Dr. Tremblay mentioned what might be lost if APD missions spent weeks in safe mode. Dr. Clampin said that if APAC were to make a recommendation, it should be meant to go higher, as this is an Agency-level issue. Dr. Hayes agreed that the Agency needs to set the priorities.

Dr. Hickox asked if it would be useful for APAC to think about the astrophysics portfolio and priorities. Dr. Clampin said yes, he wanted to know what APD should talk to SCaN about for TDAMM and access, and what should go to SMD and higher, in order to balance everything. The Agency wants to hear from APAC on this issue. Dr. Holley-Bockelmann pointed out that this has already gone to the NASA Advisory Council (NAC), which made a recommendation. Dr. Shirley Ho asked if there might be a software solution using AI or ML that can construct missing frames for lost data. Dr. Hayes said that the DSN scheduling is done in a labor-intensive way and is not highly automated. JPL is looking at algorithms to speed it up. DSN wants SCaN to set priorities for nominal operation, but DSN and SCaN are not the right places to do that. Dr. Calzetti said that she could not see how a strict set of priorities would work for science missions. There is a need to keep people involved because there are judgment calls. Dr. Hayes agreed but said he would like SMD to be an arbiter. Dr. Clampin said that several centers do this kind of scheduling, so maybe there should be dialogue with SCaN. He wants to identify the specific science left on the table because it has more impact that way.

GPRAMA Discussion

Dr. Holley-Bockelmann reopened APAC's GPRAMA discussion, reminding the members that they had voted for a Green rating on both strategic objectives. She then showed the working drafts of the examples the Committee had chosen. They would continue offline edits after this discussion.

The "Early Universe Mashup" discussed some results from JWST regarding the early universe and black holes. Dr. Joglee felt strongly that the image selected did not match the blurb and sent an alternative for APAC members to consider. There was discussion of edits to the remaining examples, but no significant objections. Upon seeing Dr. Joglee's suggested alternative image, the other APAC members agreed it was a better choice. Dr. Holley-Bockelmann said they would do the final edits offline, set priorities, and send the results to Ms. Kearns. APAC would have an internal deadline allowing them to get the document to Dr. Hasan before November 10.

APAC Discussion

The Committee reviewed potential recommendations to APD. Dr. Calzetti said that it seemed as if they were to think of FY25 and beyond. Dr. Chen agreed but thought they could discuss priorities for science capabilities. She observed that priorities seemed to give great weight to mission lifetime, and perhaps there should be a different way of thinking. For example, science capabilities could be a more important factor. APD might need a formula to make that decision. Dr. Holley-Bockelmann said that in the discussion of cutting Chandra, it felt like salt in the wound to say it is harder to run when in fact it is still excellent. Astrophysics is in this situation because they have excellent space telescopes at their disposal. Dr. Chen wondered if there might be a way to preserve parts of budget.

Dr. Hickox said he agreed that APAC should state that these issues come up because APD does missions with great science. In terms of priorities, it is not fully obvious how to determine science return per dollar for a mission, or where those are nonlinear. He wondered how much can be cut before missions are not

worth operating. It is hard to provide guidance without that knowledge. Dr. Gaskin agreed but thought Dr. Clampin wanted APAC to look at how to approach this. She asked if they might get a copy of the APD principles he said he used, though it was not clear that there was a formal document involved. Dr. Calzetti was concerned about the GO programs being cut. Dr. Jogee had further issues with possible staff cuts that might affect continuity at NASA and elsewhere. The field still needs expertise going forward. Dr. Chen noted that Chandra and HST have irreplaceable capabilities.

Dr. Holley-Bockelmann pointed out that some of the pillars in the decision matrix were to ensure continuation of the Explorer program, international partnerships, and other priorities. The Committee did not want to make unhelpful comments, and she wanted to know the extent to which he sought their input on FY24. She had the impression that things were already decided. Dr. Clampin said that he welcomed APAC thoughts. While he could not talk about future budgets, he heard the comment about asking the centers to prioritize unique capabilities, and the concern about GO funding, which APD has asked the centers to weigh very carefully. The mini-SR will occur after the FY25 PBR is released. The process is the main thing, and the overall perspective is important. APD is not shutting down anything, it is making reductions to maintain the program. However, delays push up cost caps. While delaying a large mission would have greater impact on the budget than delaying smaller projects, it is not good to do any of this and is not fair to the EC scientists who want to move forward via small missions.

Dr. Hickox thought the overall priorities in the slides were reasonable. Questions come in regard to things that can be scaled down a bit and how the changes would affect older flagship missions. He wants the mini-SR to look at the science return, factoring in the unique capabilities of the missions and the impact on the science communities. The cost of an Explorer with Chandra's angular resolution would be high. If the capability would be severely degraded, it might be worth an Explorer delay. He would want APD to consider this. Dr. Clampin said that APD spent the whole summer doing these trades. Each mission has a profile, and each has to be considered. Dr. Jogee asked for reassurance that there would be no reductions in R&A, fellowships, or the GO program. She appreciated the R&A presentation and asked if it is viable to move funding in FINESST. Dr. Clampin said that the FY24 budget keeps R&A funding flat, while the Hubble Fellows funding will go up slightly.

Public Comment Period

The public was given another opportunity for comment. Dr. Hickox read questions from the portal. The first was about how NASA plans to incorporate the comments submitted to the Federal Register pertaining to enhanced access to the findings of NASA-supported research, and if there will be transparency here. Dr. Clampin said that he has not yet seen the comments, which will be discussed at the next APAC meeting or put on the APD website. The next question was for Dr. Grinspoon, regarding potential changes to the astrobiology program. Dr. Hickox said he would pass that along.

Another question asked if there are plans for a gravitational wave SAG. Dr. Holley-Bockelmann said that SAGs are decided by the community. If people want to do this, they should go through the gravitational wave SIG in PCOS. A commenter asked if the SAGs are a way of getting free labor. Dr. Clampin said that they are not. Rather, they are a means for voluntary input. Dr. Tremblay said that this is something discussed at AAS. SAGs can review how to make this activity more worthwhile for EC persons. Dr. Hickox added that AWESOM SAG is considering the issue of compensation as it pertains to scientists for whom this would be necessary to contribute.

Regarding the status of the Pioneer evaluation and selection, Dr. Clampin said that the announcement is being deferred to the end of year when APD knows more about the budget. The final question Dr. Hickox read was a request for more on using IXPE as a model for Explorer science. Dr. Clampin said that in looking at MIDEX science, APD wants to generate a larger database of results of broad value to the science comm. TESS and SPHEREx are examples of providing long-term datasets of broad range. Small

Explorers are more self-contained and break into a new areas. IXPE is an example of that, as it does x-ray observations using a new technique.

Formulate Recommendations

Dr. Holley-Bockelmann led the formulation of recommendations to be included in a letter to APD. Dr. Caputo said she wanted to push back on the implication that Explorers can cover what flagships do. Dr. Hickox said that that was not his intention, he was just thinking about the challenge of valuing science capabilities. Dr. Caputo then said she wanted more discussion of HWO. She enjoyed the presentation, and if NASA invests in this, she agrees there is a need to go beyond exoplanets, which the HWO team said they would do. However, she felt like the START and TAG leaders were being set up as gatekeepers for approval of SIGs and SAGs, and she was not sure that that is necessary or what is intended. Dr. Gaskin said that it was unclear, but there is a process that seems to work well and she thought this might be more of a communication problem. The process does not need to change, they just need to ensure good communication.

Dr. Joglee said that the SAGs show engagement, but she worries about backlash if the process is not managed well. Time is valuable and if there is not a response saying how this is being addressed, NASA might lose people. She also sort of agreed with the free labor comment. APD needs to pay attention to make sure people do not feel unrecognized. Dr. Pascucci agreed with the previous statements. She had a further issue with the approach in Dr. Domagal-Goldman's presentation stating "evolution not revolution." Dr. Clampin said that even when current technology evolves, there is a revolution. JWST and Roman are examples but there is a need to acknowledge a constrained budget. The DS was not even initially set on continuing with flagships. APD will do revolutionary technologies. Dr. Pascucci said that her concern is the structures and where they come from, like mirrors. Dr. Clampin advised listening to the previous week's NAS talk on segmented mirrors as an example. Dr. Tremblay said that he worries that astronomers can be myopic in the early phases of the flagship development. They need to get HWO right, but he is excited about moving forward. The oversubscription on START was high, and a lot of EC people are excited about this. Dr. Clampin related that at the end of the previous year, APD met with OMB, Congressional committees, industry, and others. They universally said that this is the right approach to take. This is not being done in a vacuum. NASA has many lessons learned that it applies. Dr. Mozena said that there are new countries entering the space arena that are highly motivated by prestige and might be willing to partner with NASA on the legacy missions. Dr. Holley-Bockelmann cautioned that in vetting them, NASA will need to apply the IDEA pillars.

Dr. Joglee noted that while there had been a lot of discussion about the science community, there is have much to share with the public and she worried that this was not happening. She gave the example of how her university had students and leaders give science talks for the community, ending with star viewings. She wondered if NASA might do this for Congressional staff and others. Dr. Holley-Bockelmann said that while there are programs in NASA to do much of this, APAC might advise doing more.

Dr. Kiessling wanted APAC to look at previous recommendations to APD that remained unaddressed, and note in the letter that the Division should provide answers. Dr. Holley-Bockelmann said that over time, she has seen a change in how helpful APAC has been. Now the recommendations either seem tangential or are glossed over. She wanted advice on this. She then reviewed the list of items for the letter.

First, APAC voted unanimously to approve the FIGS SAG. Next was the issue of the student SIG; APAC had received nothing on that. Dr. Hickox said that they could say that APAC welcomes the expression of interest in forming this. Dr. Holley-Bockelmann then said that the GTN report had a lot of action items. She would not recommend all of them, and yet it seemed that APAC had been asked to go beyond the usual action of accepting the report without accepting its recommendations. Dr. Caputo said that she would accept the report, which had some good recommendations. However, the large mission

recommendation reflects the DS recommendation, which is not happening now due to the budget and other circumstances. Dr. Holley-Bockelmann agreed, noting that if there were to be a new mission, they would have to discuss whether it should even be a gamma-ray mission. Dr. Valerie Connaughton of NASA said that APD would like to know how to respond to the findings, and it would help for APAC to look at the actions and weigh in on the priorities. Dr. Holley-Bockelmann said that there was some low-hanging fruit that would be wins, but Dr. Caputo did not want to recommend anything without cost information. Dr. Clampin said that if a recommendation is problematic, APD can come back and explain that. Dr. Caputo said that the interdisciplinary aspect was interesting, and while funding pots are in the divisions, APAC could recommend collaboration within SMD. Dr. Clampin said that interdisciplinary collaboration is important, and the recommendation would provide additional weight in these arguments.

Dr. Gaskin said that in regard to a MIDEEX or probe, the approach for TDAMM is unclear given the budget situation. However, Dr. Paul Hertz, the previous division director, helped the community plan for the DS by having studies. She wondered if that might be something they could take to the SIGs. Dr. Clampin thought it was too early to engage people for the next DS. Dr. Gaskin said the studies began 5 years out, and if the community knew what was coming, they might be able to think and have hope. Dr. Clampin did not want to start one for TDAMM, because he would then need to do other pre-DS studies and the mid-DS must occur first. Dr. Gaskin thought people might self-organize in the SAGs, and noted that the DS proposals began with SIG discussions as to what missions they wanted to study. Dr. Clampin said he did not want to get ahead of the mid-DS process, which will have to involve NAS. In the WebEx chat, Dr. Burns said that the TDAMM SIG is considering proposing a TDAMM SAG like the FIGS SAG.

Dr. Holley-Bockelmann shifted discussion to the low FINESST acceptance rates. Dr. Caputo noted that Dr. Immler mentioned that many proposals come from the same institutions, and it would be good to encourage those with less resource access. Dr. Holley-Bockelmann said that while the rules are set by SMD, she would be happy to recommend that they pursue that. Dr. Tremblay cautioned that any recommendation involving a cost would mean shifting funds from somewhere else. Dr. Hickox advised highlighting that the selection rate is low but APAC would like to hear more about what the changes might look like or whether there could be an independent APD program. Dr. Jogee pointed out that Dr. Immler reported the possibility of moving up to \$7 million. She also wanted to endorse the change in the solicitation to not require the full budget, and she would like to see data on the quality of in-person versus virtual reviews. Dr. Clampin told APAC that if they wanted to endorse Dr. Immler's proposals, that would add weight to SMD discussions. Dr. Pascucci said that she agreed with Dr. Jogee regarding FINESST support options.

Dr. Kiessling wanted to know about possible guidance on selection to address imbalances in institutional representation. It would be important to avoid discussing quotas and not violate Federal laws. Dr. Tremblay said he thought the pilot of no-budget applications could lower barriers to entry and broaden the applicant pool. Dr. Gaskin added that it would be interesting to see a no-budget template for technology-based proposals. Dr. Caputo cautioned that ADAP funds students, and anything that pulled money from that program would negatively affect groups supporting students. She advised caution.

Dr. Holley-Bockelmann said that for SCaN, APAC was asked to think about decision rules for prioritizing science during oversubscription times. They had learned that none of the cubesats eating up communication bandwidth were from APD, so she thought they should recommend a trade study on science prioritization. Dr. Caputo said that this was a good idea but they needed to be flexible because sometimes cubesats will indeed warrant priority. She thought the Swift system, which is flexible, might be a model. Dr. Clampin said that it would be hard to interact with TDRSS daily. The need was to highlight the ability to do TDAMM science and how the Artemis programs affect the loss of science. He had asked for data on this, including whether the cubesats need continual access to DSN over the long term. Dr. Gaskin said that everyone will want that, so SMD needs criteria. Dr. Clampin said that the

communication issue has grown. APAC might note that Optical Comm has promise following considerable investment. Dr. Holley-Bockelmann said there would be a finding to that effect.

She also had a note that when the mini-SR happens, APAC might want to weigh in on the priorities within the review. Dr. Gaskin asked how NASA might better integrate AI into AOs. Dr. Clampin said that this is being considered, while looking at some new ideas to use AI. Dr. Ho said that a lot has already happened with imaging and gave the example of letting AI fill in alternate images. Dr. Holley-Bockelmann said that APAC would like a presentation on the possibilities here. She noted also the discussion of alternative funding for legacy missions and the letters about software access and funding. Dr. Clampin said that it could be useful to have a presentation about copyright and other challenges.

Dr. Hickox said that he was impressed with the PAGs doing things that are examples for the community. Dr. Mozena said that low Earth communication is important. He would encourage increasing collaboration and leveraging the cost savings. Dr. Holley-Bockelmann said that she would like to learn more about the demographics of the Hubble Fellows at a future meeting. Dr. Kiessling added that it would be helpful to know what leads people to turn down the fellowship, and Dr. Joguee said she would like to know what they learn about inclusive leadership. Dr. Ho wanted to learn more about how the diversity of institutions changes with DAPR.

Dr. Holley-Bockelmann thanked Dr. Hickox for his service on APAC, as this was his last meeting.

Adjourn

The meeting was adjourned at 4:54 p.m.

Appendix A Participants

Committee members

Kelly Holley-Bockelmann, Vanderbilt University, *Chair, Astrophysics Advisory Committee (APAC)*
 Daniela Calzetti, University of Massachusetts, Amherst
 Regina Caputo, NASA Goddard Space Flight Center
 Hsiao-Wen Chen, University of Chicago
 Jessica Gaskin, NASA Marshall Space Flight Center
 Erika Hamden, University of Arizona
 Ryan Hickox, Dartmouth College
 Shirley Ho, Flatiron Institute
 Shardha Jogee, University of Texas, Austin
 Alina Kiessling, Jet Propulsion Laboratory
 Mark Mozena, Planet Labs Inc.
 Iliaria Pascucci, University of Arizona
 Grant Tremblay, Harvard-Smithsonian Center for Astrophysics

NASA

Mark Clampin,
Director, APD

Tahani Amer	Edwin Griego
Lorella Angelini	David Grinspoon
David Ardila	Barbara Grofic
Rosa Avalos-Warren	Shahid Habib
Catherine Barclay	Thomas Hams
Manuel Bautista-Plaza	Hashima Hasan
Dominic Benford	<i>Executive Secretary, APAC</i>
Peyton Blackstock	Jeffrey Hayes
Gary Blackwood	Elizabeth Hays
Matthew Bolcar	Gregory Heckler
Sandra Cauffman	Paul Hertz
Ami Choi	Jennifer Holt
Stephanie Clark	Michelle Hui
Rachele Cocks	Brian Humensky
Valerie Connaughton	Stefan Immler
Julie Crooke	Hannah Jang-Condell
Patrick Crouse	James Johnson
Nino Cucchiara	Pamela King-Williams
Doris Daou	Jennifer Kearns
Jason Derleth	Bernard Kelly
Mary Dobay	Jeffrey Kruk
Terence Doiron	Peter Kurczynski
Shawn Domagal-Goldman	Alexander Kuttyrev
Ingrid Farrell	William Latter
Alise Fisher	David Leisawitz
Robert Gamble	Jack Lissauer
Opher Ganel	Eric Mamajek
Michael Garcia	Mark Matsumura
Danielle Gervalis	Julie McEnery

David Morris
 Elisabeth Morse
 Shouleh Nikzad
 Omid Noroozian
 Rupesh Ojha
 Elijah Owuor
 Lucas Paganini
 Joshua Pepper
 Mario Perez
 Marie Piasecki
 Natasha Pinol
 Swara Ravindranath
 Naseem Rangwala
 Bindu Rani
 David Richardson
 Rachel Rivera
 Aki Roberge

Rhiannon Roberts
 Andrew Rowe
 Joshua Schlieder
 Eric Smith
 Linda Sparke
 Karl Stapelfeldt
 Katherine Stevenson-Chavis
 Rita Sambruna
 Jackie Townsend
 Zoe Wai
 Debra Wallace
 Keith Warfield
 Brian Williams
 Colleen Wilson-Hodge
 Jennifer Wiseman
 John Wisniewski

Non-NASA/Unknown

Daniel Apai
 Vanessa Bailey
 Aroh Barjatya
 Amethyst Barnes
 Francesco Bordi
 Breana Branham
 Emily Braswell
 Eric Burns
 Kali Carmichael
 Francesca Civano
 Michael Coughlin
 Tansu Daylan
 Yaswant Devarakonda
 Monty Di Biasi
 M Diaz
 Tamara Dickinson
 R. Mark Elowitz
 Sylvie Espinasse
 Mike Fanelli
 Jeremy Fehrenbacher
 Jeff Filippini
 Justin Finke
 Jeff Foust
 Nate Freeman
 David Gaba
 Kamara Galbraith
 Tiffany Glassman
 Adam Goldstein
 Brian Grefenstette
 Lewis Groswald
 Karl Heinz

George Helou
 Lauren Holt
 John Holtsnider
 Teresa Jensen
 William Jones
 Steve Kendrick
 Sam Kenyon
 Steph LaMassa
 Marie Wingyee Lau
 Cathirame Lee
 James Lochner
 Renu Malhotra
 Jason Martell
 Joe Mazarrella
 Dan McCammon
 Stephan McCandliss
 Mark McConnell
 Bob McMillan
 Craig McMurty
 Margaret Meixner
 Gene Mikulka
 Drew Miles
 Richard Miller
 David Millman
 Mayra Montrose
 Jon Morse
 Mason Ng
 Alison Nordt
 Rachel O'Connor
 Roopesh Ojha
 Cristina Oliveira

April Olson
Chris Packham
Peter Plavchan
Swaraj Sagar Pradhan
Cristian Randieri
William Reach
Neill Reid
Amy Reis
Scott Richardson
Tyler Robinson
Richard Rogers
Suzanne Romaine
Marjorie Romero
Isabel Ramirez Ruiz
Richard Rogers

Wilton Sanders
Marcos Santander
Phil Scott
Paul Scowen
Elizabeth Sheley
Pat Slane
Marcia Smith
Harvey Tananbaum
David Traore
Miguel Angel Vargas Cruz
Zorawar Wadiasingh
Nicholas White
Ashlee Wilkins
Erik Wilkinson

Appendix B
Astrophysics Advisory Committee Members

Kelly Holley-Bockelmann, APAC Chair
Vanderbilt University

Hashima Hasan, Executive Secretary
Astrophysics Division
Science Mission Directorate
NASA Headquarters

Daniela Calzetti
University of Massachusetts, Amherst

Regina Caputo
Goddard Space Flight Center

Hsiao-Wen Chen
University of Chicago

Jessica Gaskin
Marshall Space Flight Center

Erika Hamden
University of Arizona

Ryan Hickox
Dartmouth College

Shirley Ho
Flatiron Institute

Shardha Jogee
University of Texas, Austin

Alina Kiessling
Jet Propulsion Lab

Mark Mozena
Planet Labs Inc.

Ilaria Pascucci
University of Arizona

Grant Tremblay
Harvard-Smithsonian Center for Astrophysics

Appendix C
Presentations

1. *Astrophysics Division Update*, Mark Clampin
2. *ExoPAG Update*, Ilaria Pascucci
3. *PhysPAG Update*, Justin Finke
4. *COPAG Update*, Shouleh Nikzad
5. *NASA Astrobiology Program*, David Grinspoon
6. *GPRAMA Overview*, Jennifer Kearns
7. *Roman Update*, Julie McEnery
8. *Habitable Worlds Observatory Update*, Julie Crooke/Shawn Domagal-Goldman
9. *Gamma Ray Transient Network SAG Report*, Eric Burns
10. *NASA Hubble Fellowship Program*, Nino Cucchiara
11. *R&A Update*, Stefan Immler
12. *NASA Space Communications and Navigation Update*, Jeffrey Hayes

**Appendix D
Agenda**

**Astrophysics Advisory Committee
Virtual
October 19-20, 2023**

Thursday, October 19

9:00 a.m.	Introduction and Announcements	Hashima Hasan/Kelly Holley-Bockelmann
9:10 a.m.	Astrophysics Division Update	Mark Clampin
10:30 a.m.	Discussion	APAC members
11:00 a.m.	Break	
11:15 a.m.	Astrophysics Division Update (Contd.)	Mark Clampin
12:00 p.m.	ExoPAG/PhysPAG/COPAG Updates	Ilaria Pascucci/ Justin Finke/Shouleh Nikzad
1:00 p.m.	Lunch	
2:00 p.m.	NASA Astrobiology Program	David Grinspoon
2:30 p.m.	Public Comment Period	
2:40 p.m.	Break	
3:00 p.m.	GPRAMA Overview	Jennifer Kearns
3:15 p.m.	GPRAMA Discussion	APAC members
5:00 p.m.	Wrap up for Day 1	Kelly Holley-Bockelmann

Friday, October 20

9:00 a.m.	Opening Remarks	Hashima Hasan/Kelly Holley-Bockelmann
9:10 a.m.	Roman Update	Julie McEnery
9:40 a.m.	Habitable Worlds Observatory Update	Julie Crooke/Shawn Domagal-Goldman
10:10 a.m.	Gamma Ray Transient Network	
	SAG Report	Eric Burns
10:40 a.m.	NASA Hubble Fellowship Program	Nino Cucchiara
11:10 a.m.	Break	
11:25 a.m.	R&A Update	Stefan Immler
12:00 p.m.	Lunch	
1:00 p.m.	NASA Space Communications and Navigation Update	Jeffrey Hayes
1:30 p.m.	Discussion	APAC members
2:00 p.m.	Break	
2:15 p.m.	GPRAMA Discussion	APAC members
3:15 p.m.	Public Comment Period	
3:25 p.m.	Discussion	APAC members
4:15 p.m.	Formulate Recommendations	APAC members
4:45 p.m.	Debrief Division Director	APAC members
5:00 p.m.	Adjourn	

Appendix E WebEx Chat Transcripts

Chat Day One

from Kelly Holley-Bockelmann to everyone: 9:02 AM

Good morning, astronomy fans! We are doing the finishing touches on our audio. Please stand by!

from Ilaria Pascucci to everyone: 9:08 AM

We cannot hear

from Kelly Holley-Bockelmann to everyone: 9:10 AM

Can you here

from Kelly Holley-Bockelmann to everyone: 9:10 AM

hear? Spelling@

from Kelly Holley-Bockelmann to everyone: 9:11 AM

Having problems again with sound. Hold tight!

from Kelly Holley-Bockelmann to everyone: 9:13 AM

Remember, if you want to post a question to our dashboard, go here:<https://nasa.cnf.io/sessions/cnat/#!/dashboard>

from Zoe Wai to everyone: 10:29 AM

Thank you Mark Clampin for the shout out to GISS in NYC!

from Nino Cucchiara he/him, NASA HQ to everyone: 10:32 AM

I cannot unmute

from Zoe Wai to everyone: 11:37 AM

In re: TOPS

House Appropriations Committee Fiscal Year 2024 bill for the Commerce, Justice, Science, and Related Agencies Subcommittee; page 128;

<https://docs.house.gov/meetings/AP/AP19/20230714/116251/BILLS-118--AP--CJS-FY24CJSSubcommitteeMark.pdf>

“SEC . 552. None of the funds made available by this¹⁵ or any other Act may be used to implement, administer,¹⁶ apply, enforce, or carry out the Office of Science and¹⁷ Technology Policy’s August 25, 2022, Memorandum to¹⁸ Executive Departments and Agencies entitled, “Ensuring¹⁹ Free, Immediate, and Equitable Access to Federally²⁰ Funded Research.”

from Kelly Holley-Bockelmann to everyone: 11:37 AM

Remember, if you want to post a question to our dashboard, go here:<https://nasa.cnf.io/sessions/cnat/#!/dashboard>

from Zoe Wai to everyone: 11:38 AM

“SEC . 552. None of the funds made available by this or any other Act may be used to implement, administer apply, enforce, or carry out the Office of Science and Technology Policy’s August 25, 2022, Memorandum to Executive Departments and Agencies entitled, “Ensuring Free, Immediate, and Equitable Access to Federally Funded Research.”

from Kelly Holley-Bockelmann to everyone: 11:41 AM

Illaria I see you and you'll be next

from Ronald Gamble to everyone: 12:19 PM

I'd be happy to talk more about my Student SIG!

from Ryan Hickox to everyone: 12:20 PM

Thanks Gary and Ron!

from Alina Kiessling to everyone: 12:21 PM

Anyone from the public can submit questions here: <https://nasa.cnf.io/sessions/cnat/#!/dashboard>

from Ryan Hickox to everyone: 12:26 PM

Quick correction! (mea culpa) - next meeting is this Monday to avoid the APAC meeting. But most full SAG meetings are Fridays at 11am ET.

from HASHIMA HASAN to everyone: 12:31 PM

Science Mission Directorate Quarterly Community Town Hall October 19, 2023

NASA's Science Mission Directorate will hold the quarterly community town hall meeting with Associate Administrator for Science Nicky Fox and her leadership team at 1:00 p.m. Eastern Time on Thursday, October 19, 2023. Participants are invited to submit their questions below and/or vote up questions already posted. Members of SMD, the science community, academia, the media, and the public are invited to participate by joining the WebEx link below.

Date: October 19, 2023

Time: 1:00 pm – 2:00 pm Eastern Time

Location: WebEx:

<https://nasaenterprise.webex.com/nasaenterprise/j.php?MTID=m481605f05fb2d8615045133b4aac4a5c>

from HASHIMA HASAN to everyone: 12:32 PM

Participants are invited to submit their questions and/or vote up questions already posted at SMD Quarterly Community Town Hall - October 2023 - NASA (cnf.io)

from HASHIMA HASAN to everyone: 12:33 PM

<https://nasa.cnf.io/sessions/kakd/#!/dashboard>

from Ryan Hickox to everyone: 12:58 PM

Thanks everyone!

from Ilaria Pascucci to everyone: 2:30 PM

unfortunately, we lose the audio at times

from Bob McMillan Ext to everyone: 2:31 PM

Good to know that it's not local to me.

from David Traore to everyone: 2:36 PM

The HWO SAG do have scientists and technologists working together.

from David Traore to everyone: 2:39 PM

The New Great Observatories NGO SAG I mean.

from Renu Malhotra to everyone: 2:47 PM

(From Renu Malhotra) Thank you for taking my comments in real time during the Public Comment time.

In case it is helpful, here is a brief summary again: My comment is on certain specifics of NASA's proposed policy regarding software sharing. The proposed policy would place a high burden on small groups and individual researchers. The burden to produce detailed documentation and support of publicly shared software products would take resources away from productive research. NASA could explain the rationale for imposing this burden and what existing problem would be solved by this policy.

from Ryan Hickox to everyone: 3:29 PM

Me too!

from Ryan Hickox to everyone: 3:38 PM
Agreed - the Betelgeuse one works really well for this assessment.

from Ryan Hickox to everyone: 3:49 PM
1 for me

from Ryan Hickox to everyone: 3:51 PM
yes to ixpe+nustar

from Kelly Holley-Bockelmann to everyone: 4:03 PM
<https://chandra.harvard.edu/photo/2023/tde/>

from Ilaria Pascucci to everyone: 4:08 PM
<https://www.nasa.gov/universe/exoplanets/webb-discovers-methane-carbon-dioxide-in-atmosphere-of-k2-18-b/>

from Ryan Hickox to everyone: 4:14 PM
I think I'm conflicted

from Ryan Hickox to everyone: 4:14 PM
(the first author is a grad student at Dartmouth!)

from Jessica Gaskin to everyone: 4:19 PM
https://chandra.si.edu/press/22_releases/press_110222.html

from Shardha Jogee-Bromm to everyone: 4:20 PM
<https://ui.adsabs.harvard.edu/abs/2023ApJ...946L..13F/abstract>

from Ryan Hickox to everyone: 4:32 PM
See pages 41 and 42 of here: <https://www.nasa.gov/wp-content/uploads/2023/03/fiscal-year-2024-volume-of-integrated-performance.pdf>

Chat Day Two

from Ilaria Pascucci to everyone: 9:02 AM
the audio is interrupted at times

from Shirley Ho to everyone: 9:02 AM
Yes, the audio is coming in and out.

from Elizabeth Sheley Ext to everyone: 9:04 AM
not hearing anything

from Joshua Pepper to everyone: 9:06 AM
yes we can

from Nino Cucchiara he/him, NASA HQ to everyone: 9:06 AM
yes

from Jennifer to everyone: 9:06 AM
Yes

from Elizabeth Sheley Ext to everyone: 9:06 AM
inconsistent

from Shirley Ho to everyone: 9:06 AM
yes

from Doris Daou to everyone: 9:06 AM
Audio in and out

from Vanessa Bailey she,her to everyone: 9:06 AM
I can only hear Kelly well

from Eric Burns to everyone: 9:07 AM
We can typically hear Kelly and those near her, but not others

from Ryan Hickox to everyone: 9:07 AM

Audio is coming in and out again

from Francesca Civano to everyone: 9:08 AM

can Julie test her mic?

from Francesca Civano to everyone: 9:09 AM

Wonderful!

from Francesca Civano to everyone: 9:09 AM

we can hear it

from Kelly Holley-Bockelmann to everyone: 9:11 AM

Good morning, friends! We are happy to have you here!

from Kelly Holley-Bockelmann to everyone: 9:49 AM

Remember, you are welcome to submit questions to our public dashboard:

<https://nasa.cnf.io/sessions/cnat/#!/dashboard>

from Lauren Holt to everyone: 9:56 AM

Is there a link to the discussion on next generation rockets?

from Grant Tremblay APAC member to everyone: 9:56 AM

yup, it was at the CAA meeting, hold on

from Grant Tremblay APAC member to everyone: 9:57 AM

so there's a video (see Day 2) here - i'm still looking for Lee's slides, which I thought were posted:

https://www.nationalacademies.org/event/40161_10-2023_committee-on-astronomy-and-astrophysics-fall-2023-meeting

from Grant Tremblay APAC member to everyone: 9:59 AM

the slides *should* be posted under "meeting materials" on that link .. might take a few more days, sorry!

from Lauren Holt to everyone: 10:15 AM

Thank you Grant

from Grant Tremblay APAC member to everyone: 10:18 AM

The presentation Mark is talking about starts at the very beginning of this video:

<https://vimeo.com/event/3785040>

from Shardha Jogee-Bromm to everyone: 10:18 AM

Can we have the link for the NAS presentation?

from Grant Tremblay APAC member to everyone: 10:19 AM

NAS is required to post Lee's slides, but they're not up yet. I've asked for a copy

from Grant Tremblay APAC member to everyone: 10:20 AM

this is the Roman CGI paper Mark just linked: <https://arxiv.org/pdf/2309.16012.pdf>

from Grant Tremblay APAC member to everyone: 10:20 AM

(just spoke about, sorry)

from Grant Tremblay APAC member to everyone: 10:21 AM

here is the GTN SAG report:

https://pcos.gsfc.nasa.gov/sags/gtnsag/documents/GTN_SAG_Report_v2.pdf

from Shardha Jogee-Bromm to everyone: 10:23 AM

Thanks Ryan. Please share the NAS slides when you get them

from Shardha Jogee-Bromm to everyone: 10:23 AM

Sorry I meant Grant.

from Zoe Wai to everyone: 10:24 AM

Committee on Astronomy and Astrophysics Fall 2023 Meeting | National Academies Segmented mirror presentation given on Day 2, Oct. 13 Weblinks to recorded sessions and agenda in

https://www.nationalacademies.org/event/40161_10-2023_committee-on-astronomy-and-astrophysics-fall-2023-meeting

from Ryan Hickox to everyone: 10:58 AM

NHFP Panel Report: https://smd-cms.nasa.gov/wp-content/uploads/2023/04/Hubble-Fellowship-Review-Doc-2021-12-15_Tagged.pdf

from Ryan Hickox to everyone: 11:01 AM

Report response: <https://smd-cms.nasa.gov/wp-content/uploads/2023/09/response-to-the-nhfp-review-5-sept-2023.pdf>

from Kelly Holley-Bockelmann to everyone: 11:02 AM

Thank you to Ryan and Grant for so quickly providing important links to documents referred to today!

from Ryan Hickox to everyone: 11:03 AM

<https://www.nhfp-equity.org/>

from Ryan Hickox to everyone: 11:04 AM

<https://www.nhfp-equity.org/mentorship-program#h.oh6humvb6n42>

from Ryan Hickox to everyone: 11:04 AM

<https://forms.gle/y4xrF9HjypzdY1DZ7>

from Rita Sambruna she/hers to everyone: 11:09 AM

that was one of the findings and recommendations of the report. Diversity of institutions.

from Rita Sambruna she/hers to everyone: 11:10 AM

it is not a trivial issue

from Rita Sambruna she/hers to everyone: 11:11 AM

the recommendation to change the culture of the field that rewards individual excellence and not team excellence and building

from Ryan Hickox to everyone: 11:17 AM

Thanks for pointing back to the report - just looking at the report, findings 20-24 from the report highlight those points about institutional diversity.

from Rita Sambruna she/hers to everyone: 11:18 AM

thanks Ryan for raising the topic!

from Ryan Hickox to everyone: 11:20 AM

This is a great point Nino is making - but one flipside of that is that searches for permanent positions sometimes over-emphasize whether someone has earned a Hubble or similar prize fellowship.

from Ryan Hickox to everyone: 11:20 AM

Another issue related to culture in the community!

from Rita Sambruna she/hers to everyone: 11:21 AM

especially considering that the oversubscription fraction means that a LOT of excellent candidates are declined

from Ryan Hickox to everyone: 11:23 AM

Exactly, thank Rita.

from Ryan Hickox to everyone: 11:24 AM

That should say *thanks Rita* :-)

from Zoe Wai to everyone: 11:26 AM

Good discussion is worth the delay ...

from Shardha Jogee-Bromm to everyone: 11:27 AM

Nino: some other prize fellowships (e.g. Hering Simons) are also asking for answers before NHFP, causing fellows to decline NHFP

from Nino Cucchiara he/him, NASA HQ to everyone: 11:28 AM

@Shardha, we have not look at this in details, but I am curious about this and will bring this information back to the taskforce. Unfortunately, we have no control on other offers deadlines. Though we are in ocntact with the prospective fellows once the offers are out

from Shardha Jogee-Bromm to everyone: 11:37 AM

Thanks Nino. Also Here is one common definition (among many) of an Inclusive leader: a candidate who will foster an inclusive climate that empowers everyone to embark on the scientific journey and leads to a diverse STEM community of junior scientists. In many academic institutions, for faculty position we ask candidates to provide a statement of their contributions and plans to build an inclusive STEM community. I wonder if there would be support for asking this type of statement for NFHP.

from Nino Cucchiara he/him, NASA HQ to everyone: 12:25 PM

Thanks Shardha, we have to adapt definitions like this for the NHFP which is a postdoctoral positions.

from G. Heckler to everyone: 1:09 PM

Is there a new start time?

from Shirley Ho to everyone: 1:09 PM

New start time at around 1:30pm

from Daniela Calzetti to everyone: 1:12 PM

Please, let me know when we are back in session. Currently I cannot hear anything. Thank you.

from Kelly Holley-Bockelmann to everyone: 1:21 PM

Friends, we are resuming!

from Eric Burns to everyone: 2:05 PM

It only works nightside. Fine for much of astro, but not others

from Ryan Hickox to everyone: 2:05 PM

Right, also is there dependence on cloud cover?

from Eric Smith to everyone: 2:08 PM

The APAC should take the recomendtion to the NAC. The APAC itself advises the division director.

from Kelly Holley-Bockelmann to everyone: 2:10 PM

The NAC has undertaken the deep concern about the DSN to heart at the last meeting. I am sure they would welcome further discussion about APD mission decision rules and optical technology

from MICHAEL GARCIA to everyone: 2:10 PM

none of the Artemis 1 cubesats came from Astro

from Eric Smith to everyone: 2:13 PM

Takes time to change the quills for the different ink each mission uses.

from Kelly Holley-Bockelmann to everyone: 2:14 PM

Michael, I didn't know

from Kelly Holley-Bockelmann to everyone: 2:14 PM

Oh, sorry -- meant to say Thanks, Michael!

from Catherine Barclay to everyone: 2:16 PM

What is SCaN's target date for having commercial services defined, with cost, for science mission proposers?

from Eric Burns to everyone: 2:19 PM

Psyche will demonstrate at 1 AU, not at 16 Psyche (6 AU)

from Shirley Ho to everyone: 2:20 PM

2:35pm :) ET

from Kelly Holley-Bockelmann to everyone: 2:21 PM

We will be back in 15 minutes, at 35 after the hour

from HASHIMA HASAN to everyone: 2:22 PM

@2:35 pm EST

from Valerie Connaughton to everyone: 4:01 PM

Advice on how NASA might respond to some of the findings

from Eric Burns to everyone: 4:15 PM

TDAMM SIG but we are considering proposing a TDAMM SAG like the FIGS SAG

from Eric Smith to everyone: 4:24 PM

The retreat was quite productive and Stefan did a great job organizing it!

from Ryan Hickox to everyone: 4:27 PM

This is something we should definitely highlight

from Zoe Wai to everyone: 4:29 PM

There has been a lot of recent discourse about / by NASA (and government) about not be able to hire and / or retain top talent because private industry offers much higher salary / compensation ...

from Nino Cucchiara NASA HQ he/him to everyone: 4:35 PM

Regarding to FINESST and improving institutional diversity, check section 12.25 of ROSES Call

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