NASA ADVISORY COUNCIL

Planetary Science Advisory Committee

November 12-13, 2024

MEETING MINUTES

Hope A. Ishii

Digitally signed by Hope A. Ishii
Date: 2025.01.05 00:54:27 -08'00'

Dr. Hope Ishii, Chair
University of Hawaii at Manoa

Katharine Robinson

Digitally signed by Katharine Robinson
Date: 2024.12.30 11:46:56 -05'00'

Dr. Katharine Robinson, Executive Secretary
NASA Headquarters

Table of Contents

Prepared by Elizabeth Nellums
Tom&Jerry, Inc

Tuesday, November 12, 2024

Welcome and Introductions

Dr. Katie Robinson, Designated Federal Officer, called the meeting to order at 10AM. The meeting was entirely virtual. She reminded everyone that the Planetary Science Advisory Committee (PAC) holds public meetings and also that all members are expected to announce any conflicts of interest and step aside from ensuing discussion. She then introduced Dr. Hope Ishii as chair of the PAC. Dr. Ishii welcomed all attendees and members of the community who joined the meeting. Dr. Ishii welcomed Mr. Brent Barbee, Dr. Morgan Cable, Dr. Shannon Curry, Dr. Lisa Danielson, Dr. John Grant, Dr. Kandi Jessup, Dr. Walter Kiefer, Dr. D'Arcy Meyer-Dombard, Mr. David Murrow, Dr. Louise Prockter, Dr. Tyler Robinson and noted that Dr. Deborah Woods would be joining late. Dr. Ishii thanked the meeting support staff. She noted that this was her own final meeting, as well as that of Dr. Kiefer, Dr. Danielson, Dr. Meyer-Dombard and Dr. Robinson. They served 3.5 years due to a change in membership dates. She thanked Planetary Science Division (PSD) leadership for the opportunity, as well as past and present PAC members who advised her in her role as chair, the Executive Secretaries and all staff who provided support. The next meeting will be chaired by Dr. Shannon Curry in 2025, dates TBD.

Mr. David Murrow thanked Dr. Ishii on behalf of the committee. Dr. Robinson announced five new members joining the PAC in January and said community members who might be interested can self-nominate.

Dr. Ishii thanked Mr. Murrow and Dr. Robinson for representing PAC to the Heliophysics and Astrophysics Departments in the GPRAMA discussions. Then she shared the mission of PAC and the conventions of the virtual meeting.

Update from NASA Advisory Council (NAC)

There has been a backlog of getting NAC approval so work performed in 2022 and 2023 was just recently approved. The backlog has been of some concern. The Science Committee met twice in 2024, but the NAC met once in October. These are public meetings.

The PAC chair is appointed to the Science Committee by the administrator. Dr. Ishii will roll off the Science Committee at the end of 2024. The PAC chair has the responsibility to elevate findings that have relevance beyond the PSD, and the committee makes findings and recommendations that go to Science Mission Directorate (SMD). The Science Committee findings and recommendations have to be forwarded to the NAC before SMD can receive and respond to them. Those findings are then transmitted or directed for action to SMD Associate Administrator, Dr. Nicola Fox, or the NASA administrator. The intent going forward is to regularize the cadence of both meetings, getting to three times a year.

At the October 8th meeting of the Science Subcommittee, Dr. Ishii reported on membership and meeting schedule, GPRAMA discussion outcomes, and recent and upcoming topics. The Science Committee has not yet finalized their findings and recommendations but draft findings were

presented in an outbrief to Dr. Fox. In that outbrief, the PAC's concerns were heard, including those related to DEI (Diversity, Equity and Inclusion) at NASA, the VIPER cancelation, the need for transparency as well as balance in extending and starting new missions, the importance of the Mars Sample Return, High-End Computing availability and accessibility, and the Antarctic Search for Meteorites (ANSMET) logistical support.

Dr. Cable asked when the NAC plans to finalize their findings out of the science committee. Dr. Ishii said it will be a few months.

Mr. Murrow asked for a sense of the NAC's feelings about the linkage between Mars Sample Return (MSR) and the Moon to Mars program. Dr. Ishii noted she's not a member of the NAC but didn't think there was a lot of discussion around MSR, although there was also no pushback.

Planetary Science Division Update

Dr. Gina DiBraccio, Acting Director of the Planetary Science Division, shared staffing changes within the division. Dr. Charles Webb will be the new PSD Deputy Director. She provided an overview of the Planetary Science fleet. NEO Surveyor and Dragonfly are confirmed missions, and Europa Clipper is operating. It launched October 14th, delayed by Hurricane Milton. Jupiter orbit insertion is planned for April 2030. The mission is to determine if Europa is habitable, not to search for signs of life. The boosters for Clipper were reused from the Psyche mission, a year prior. There will be a flyby of Mars. The Hera mission launched on October 7th, one week before Clipper. It's an ESA mission and NASA is a partner with participating scientists. NEOWISE was decommissioned in August and re-entered the earth's atmosphere to burn up on November 1 after great success. NEO Surveyor is a follow-on mission looking for near earth objects.

The Lucy mission had its first asteroid flyby of the asteroid Dinkinesh. The data from that flyby will be available for the Discovery Data Analysis Program in the Research Opportunities in Space and Earth Science (ROSES)-2024 program, and will be part of the L4 Trojans Participating Scientist Program. The spacecraft Psyche is operating nominally, having launched in October 2023. The arrival at the asteroid, also named Psyche, is August 2029. The Deep Space Optical Communications system is transmitting messages from 460 million kilometers, further than the distance between earth and Mars.

Dr. DiBraccio provided several updates on Martian exploration, including that the Rosalind Franklin Support and Augmentation project has passed Key Decision Point (KDP) A/B and is now in Phase B. The Mars Sample Return Strategy Review Panel will recommend architecture to provide the highest likelihood of returning samples before 2040 and/or for less than $11B.

The VIPER project was discontinued by NASA on July 17, 2024. A Request for Information (RFI) was issued to potential partners interested in continuing the mission. NASA has formed a committee to assess the responses to this request, and is also in discussion with international partners.

There are no changes to the budget relative to the last PAC meeting. The enacted budget is through 2024, with FY 2025 being the President's budget.

Dr. DiBraccio reviewed upcoming Announcements of Opportunity. The next New Frontiers will be no earlier than 2026. The asteroid Apophis has a close earth encounter in 2029. The European Science Agency (ESA)'s Rapid Apophis Mission for Space Safety, stylized as Ramses, is in preparation until the 2025 ministerial. OSIRIS-APEX will rendezvous with the asteroid after its close approach.

Finally, Dr. DiBraccio covered the discussion around the Lunar and Planetary Science Conference (LPSC). NASA is looking into ways to support this meeting through a Non-Reimbursable Space Act Agreement with a partner, similar to AbSciCon. There is an active RFI for this.

In other community information, Dr. DiBraccio shared that an RFI is open until February 4, 2025 to gather input for the 2025 Decadal Astrobiology Research & Exploration Strategy. Eight new Planetary Science Enabling Facilities were selected through ROSES 2024. Finally, NASA has received the draft report of the Independent Study Team on the NASA Postdoctoral Program. Once NASA has formulated their response, this information will be made public.

There is a public draft of the Planetary Science Technology Development Strategy. The first Planetary Science Technology Symposium was held at NASA Glenn Research Center on October 21-24 and had 150 attendees. She also provided an update on the successful Europa internship program.

In responding to the prior findings of the PAC, Dr. DiBraccio shared the following *(these responses are summarized - the full responses are available in the public presentation)*:

- On the Mars Sample Return (MSR), the Mars Chief Scientist, Planetary Science Division Director, and Nasa Chief Scientist are coordinating the science messaging, and continues to advocate for MSR as one of NASA's top science priorities.
- On the recommendation supporting inclusive pathways, Dr. DiBraccio responded that NASA appreciates the recommendation and profiled the steps being taken on inclusion at all career stages.
- On the recommendation on the Deep Space Network (DSN), Dr. DiBraccio responded that PSD actively works to manage the resource and outlined the steps already being taken.
- On the recommendation for ANSMET, Dr. DiBraccio responded that NASA recognizes the importance of the program and outlined the current status of the logistics and support for the search for extraterrestrial samples in Antarctica. No formal proposal of an implementation alternative has currently been presented.
- On the finding on nuclear fission power for exploration, PSD thanks the PAC for this finding.

- On the finding on the cadence for CLPS/Artemis instrument calls, PSD and ESSIO recognized the challenges of providing reliability and that the ROSES 2023 solicitation had several types of calls that took longer to develop and release than originally anticipated.
- On the NASA Shared Services Center (NSSC) finding, PSD acknowledged the issues and thanked the PSD for the finding, stating that SMD is in discussion with NSSC leadership to resolve these issues.

Q&A/Discussion:
Dr. Ishii thanked Dr. DiBraccio and asked about the current staffing situation. Both Dr. DiBraccio and Dr. Lori Glaze's details are for six month and the plans moving forward have not been announced yet. The end of the sixth months is the end of this month. Dr. DiBraccio requested time to address this question.

Dr. Ishii asked about the MSR mission studies. The team is hard at work reviewing all the reports right now. Are those reports including recommended architecture? Dr. DiBraccio confirmed that they are. The Sample Return Campaign is reviewing the industry teams on recommended architectures and will come up with a recommendation to NASA SMD and the administrator. The timeline is end of this year/ early next.

Mr. Murrow asked how durable the recommendations on MSR and human exploration of Mars are, considering the new administration and new voices. Dr. DiBraccio said they are continuing to submit Mars Future Plans and are excited to see what ideas and opportunities are in there.

Dr. Ishii noted that the budget plot looks ominous for MSR, asking if there are any insights on impacts on budget with the administration change. Dr. DiBraccio said NASA is under a continuing resolution (CR) until Dec 20 and is currently using the FY25 President's request for the charts shared in the meeting.

Dr. Cable asked if the New Frontiers (NF) budget is accurately depicted as going down after the Dragonfly launch – does that take into account the NF-5 selection? Dr. DiBraccio said that it does. The final AO will hopefully be out in 2026.

Dr. Cable asked if NASA is waiting for the Committee on Astrobiology and Planetary Science (CAPS) recommendations for NF, or if that is expected at the Lunar and Planetary Science Conference (LPSC). Dr. DiBraccio said the original expectation was the end of the summer. It will not be as far out as LPSC, but it depends on when PSD gets the recommended target list.

Dr. Cable asked why the period was so short on the LPSC conference RFI. Dr. DiBraccio said to plan a conference of the scale of LPSC, it's necessary to plan forward which has to happen as soon as possible. Dr. Ishii asked if the RFI went beyond the normal channels to reach a broader audience. Dr. DiBraccio said she would ask Ms. Tiffany Morgan, who along with the internal team has put in a lot of work on LPSC. Shortly afterwards, she confirmed that it went out on NSPIRES and Sam.gov, but also on social media and in the newsletters.

Dr. Curry said she is excited to hear about the success of the Clipper internship and that the Here 2 Observe (H2O) program has also been effective. She asked if that opportunity will be available for other missions and programs. Also, since participants are mainly funded for their time, would it be possible to expand the funding to cover lab and field work? Dr. DiBraccio said there are currently no plans yet to expand to other missions, but this is the inaugural year and is still a test. She added that Dr. Nahm will be able to answer those questions better.

Specific to the previous findings and PSD's response, Mr. Murrow was asked if he feels the Moon to Mars and Mars Sample Return response was satisfactory. He responded that PAC tried to be specific in the finding about an action to link the two programs, yet the response didn't address that. He didn't see evidence of those discussions going on, although he's pleased the recommendation was raised to the NAC and that all parties understand the importance of MSR. Dr. Ishii commented that PAC needs to find a way to present the finding so it doesn't seem like "just" a PSD problem and they might ask staff for assistance there.

NASA Community Support

Adding more context to the discussion of the LPSC, Ms. Tiffany Morgan addressed the team on community support funding, much of which is due to expire soon, while Dr. Kiefer recused himself due to work involvement. New laws around cooperative agreements, grants and conferences mean that NASA's support needs to evolve to ensure the community has an effective way to collaborate and share ideas. Ms. Morgan provided an overview of the process and the progress to date. NASA will support conferences like LPSC but can't lead or be the primary sponsor. There is an Action Team working towards progress on this goal.

Q&A/Discussion:

Dr. Ishii thanked Ms. Morgan and asked about the field of players in supporting the conference. How many proposals were submitted? Ms. Morgan deferred to Dr. Vander Kaaden on that.

Dr. Cable asked if the short time period will bias the decision towards larger organizations that can respond quickly. Ms. Morgan noted that the RFI isn't for proposals, just ideas. There will be a longer window with more time for proposals through an Announcement for Partnership Proposals (AFPP), to ensure there is sufficient interest.

Dr. Grant was surprised at the suggestion that LPSC might not occur annually and hoped that the community would be able to weigh in on that. Given the pace at which planetary results come forward, it could be quite detrimental. Ms. Morgan agreed that the community needs annual engagement and hoped that will be the path forward. She added that she does not believe the community will be able to weigh in on proposals, suggesting Dr. Aaron Burton may know more. There are three proposals for supporting the Planetary Sample Science Community. The review process hasn't been established yet. It's possible to ask for community review but it's not mandated in the process. Dr. Ishii asked what metrics would be used to evaluate. Ms. Morgan said they are not known yet but will be spelled out in the AFPP. Dr. Cable thanked staff for all

their hard work behind the scenes to get this done, stating that the conference is very important to the community.

Dr. Prockter asked how the centers will be involved, given Johnson Space Center's past involvement. Ms. Morgan said under the new model, NASA will still be allowed to be involved but a center could not host because NASA being the primary sponsor would change the process. The conference would ideally rotate locations.

Dr. Jessup asked whether community members would be engaged on questions of the forum and format. Dr. Burton said additional requirements will make it more NASA's meeting than the community's meeting. Dr. Ishii suggested a metric could be community input. Ms. Morgan thanked the PAC and said she would look into that. Dr. Burton noted that AbSciCon gets community feedback and it has to be made available to NASA.

With extra time in Q&A, Dr. Ishii asked Dr. DiBraccio about inclusion plans. PSD does not currently require them, but SMD is working on an evaluation rubric, Dr. Shannon Fitzpatrick has noted that Planetary Mission Senior Reviews do have a required inclusion plan. Dr. Amanda Nahm of SMD explained that the Directorate is involved in anything under ROSES. Twelve programs are using inclusion plans already through that program. Once the rubric is approved by Dr. Fox, it will help program officers and reviewers evaluate them.

Dr. Michael New, SMD Deputy Associate Administrator for Research (DAAR), provided an additional overview of the process. Inclusion plans started as a grassroot effort, with program officers in a couple divisions wanting to try it. What Dr. Nahm has been doing is working across the divisions to come up with some basic principles and standards. The SMD Interim Document (SID), lays out options and recommendations, particularly that evaluation should be led by experts. Scientists can be in the room and contribute, but the lead reviewer is an expert in inclusion. Amanda added that there's a presentation that is public on this. Dr. New said it's a pilot and divisions can opt in, but PSD was doing a lot of other pilots already and thus did not opt in. There is also an intern coming to review what's already been done.

Dr. Ishii noted that perhaps the PAC could make a finding about the need for community support since she keeps hearing the word "yet" while it's already happening in some places.

Mr. Murrow asked Dr. DiBraccio if the discontinuation of VIPER has made money available to other stressed areas. Dr. DiBraccio said the money remains within the Lunar Discovery and Exploration Program (LDEP). The portfolio supports Commercial Lunar Payload Services (CLPS) activities that might not have otherwise been supported. VIPER still went through environmental testing, so at this point the workforce was already rolling off and NASA will still be supporting the closeout – it's a ramp down, it's not funds becoming available.

Dr. Jessup noted that the discussion of the inclusion planning was coming from PAC's previous request that the metrics be clear, and she appreciated that PSD is taking the time to see how it worked in other divisions. Dr. Ishii agreed.

Europa ICONS

Dr. Nahm provided an overview of the Inspiring Clipper: Opportunities for Next-generation Scientists (ICONS) internship program. Mentors are members of the Europa Clipper team and were paid one month's salary to compensate for the work of mentoring. Interns were compensated competitively and had relocation and housing as well as a group trip to JPL. Paying the mentors for their salary as well as the trip to JPL was over 60% of the program cost. The program received over 3,000 applications, about 2,800 that were eligible. Most students applied to just one or two projects. Preference was given to students at non-R1 institutions since R1 institutions (meaning those with a heavy investment in research according to the Carnegie Classification of Institutions of Higher Education) were the most likely to have active participation in planetary spacecraft missions already. Students from 17 states and Puerto Rico were selected. The students are doing important science. The program will also be offered in 2025 and applications will be due February 2025; the prior interns are now being matched with new interns.

Lunar Reference Frame

Dr. Robin Fergason shared the findings and recommendations of the Lunar Reference Frame Working Group. The MAPSIT/LEAG white paper recommends the use of the Mean Earth coordinate system over the Principle Axis system as the lunar reference frame for mapping. Dr. Fergason reviewed the recent activities of the working group. They developed a consensus and presented their findings with concurrence of the non-decisional Federated Board. Their findings and recommendations will be discussed during the Moon to Mars Architecture Concept Review to adopt for the Moon to Mars (M2M) architecture. The decision would constitute an agency wide agreement on reference frames to use at the lunar surface. Dr. Fergason felt that this finding has been fully addressed, and asked for confirmation from the PAC as well as input on their proposed path forward.

Stakeholders currently use multiple reference frames. No single reference frame will be ideal for all use cases and stakeholders, and it would disrupt Artemis activities to require a single frame. Radio navigation systems at the moon can only broadcast data in a single frame, so it will be necessary to transmit additional data to support transformation by users. Reference frame uncertainty represents approximately 10% of the Artemis navigation error budget. There are other sources of error beyond frame uncertainty. She reviewed the details of the recommendations and proposed next steps as well as continued opportunities for discussion.

Q&A/Discussion

Dr. Ishii asked Dr. Nahm about the long term plan for ICONS; would students who already participated be able to participate again, or just in the mentoring of new interns? Dr. Nahm said the intention is to have new students every year, in order to build up the number of scientists and engineers available to do work later in the mission. There is no shortage of applicants. Keeping the students connected is a major challenge; the students themselves have suggested a LinkedIn group and a newsletter.

Dr. Curry asked how the H2O program selected the missions involved. Dr. David J. Smith, lead program officer for that program, said the decision comes from the PSD division director. There's room to grow and the program will be inviting two more missions in the next cycle. On the question of whether lab or field work is covered, Dr. Nahm said students did lab and field work in the program, but the idea was to cover the mentor's time and the student costs and travel, so the travel and expenses could not be covered for the mentor. The program did pay for all the disposables. Dr. Ishii asked if there's a mechanism for missions to request to be considered? Dr. Nahm said the program could expand once it works out the kinks but they'd have to change the acronym. It wouldn't be any sooner than 2026.

Mr. Murrow noted that the requirement for all spacecraft to broadcast their position in the reference frame and the info required to transform it seemed a bit open ended. It's important that it be clear so that any ground users can translate. Dr. Fergason said the requirement is for people using anything other than the accepted frames. The broadcast requirement is a bandwidth limitation. The recommendations were mainly to ensure that the architecture, which doesn't currently exist, continues to be developed.

Dr. Kiefer said that the question of reference frames seems resolved it to the point that Dr. Fergason shouldn't have to present at every meeting. Dr. Ishii agreed. Dr. Fergason said she would ask to be added to the agenda if anything exciting happened.

R&A Update

Dr. Kathleen Vander Kaaden provided updates on staffing changes on the R&A team. She then provided an overview of the ROSES program and discussed the selection rates, which have a wide range (but few are less than 20%). There are four programs with notification dates greater than 180 days from the submission date. She compared this to the No Due Date (NoDD) program, where selection rates are between 30%-62% and no notification periods longer than 180 days. In the cross divisional programs, only Habitable Worlds notifications are close to 180 days; the rest are shorter.

At a prior PAC meeting she was asked about the unique proposers to the various efforts of PSD. In fiscal year 2023, there was 937 unique people supported by competitive activities in PSD R&A and 84% were from non-NASA centers.

Dr. Vander Kaaden then turned to the Planetary Science Enabling Facilities. The selection rate was about 62%. There are 17 geographically distributed facilities, an investment of $7 million per year.

For ROSES 2024, the NASA Grant and Cooperative Agreement Manual has replaced the Proposer's Guide following changes to 2 CFR 200.

No analog test to support Artemis Lunar Operations was identified that would be appropriate for integration with a competed science team for ROSES 2024. There are other opportunities for operations analogs and the call will be solicited in ROSES 2025.

Dr. Vander Kaaden shared changes to the Future Investigators in NASA Earth and Space Science and Technology (FINESST) program, which will be reviewed as dual anonymous in ROSES-2024. New requirements have also been added for Fieldwork. Not every program is solicited every year. New programs include Solar System Science and the Artemis III Participating Scientist Program, which will likely be on a different schedule.

The planned merger of the Emerging Worlds, Solar System Workings, and Solar System Observations programs into a Solar System Science program has been previously reported on. Starting in ROSES-2025, the Planetary Science and Technology Through Analogue Research (PSTAR) will solicit proposals for both planetary (including lunar) and astrobiology research. Also in ROSES-2025, the Laboratory Analysis of Returned Samples (LARS) will no longer include Genesis and Stardust, which will go to the Solar Science call. This will allow additional support for OSIRIS-Rex sample analysis and preparations for Artemis and Mars Sample Return. Also in ROSES 2025, proposals that would have previously been submitted to Habitable Worlds will instead go to Exobiology or the Exoplanets Research Program. This is in response to community feedback and is an effort to reduce barriers and make things a bit clearer. It's not a funding cut, just a redistribution.

Dr. Vander Kaaden reviewed some preliminary analyses of the No Due Date (NoDD) programs. Finalized data will be shared with the public, likely in December. The team evaluated whether proposers were taking advantage of the flexibility by submitting throughout the year and found a big spike of submissions in March, the end date of ROSES. If the NoDD program was reducing workload, there would be a reduced number of proposals submitted. That did occur. To evaluate whether the program was helping reduce notification periods, they evaluated how many proposers were notified within 180 days of submission and found that 80% met this goal.

Dr. Smith thanked and acknowledged his team members and the R&A Team, center managers and science leaders. There are over 260 individuals involved. He shared the history of NASA's Internal Scientist Funding Model (ISFM), which is being reviewed by the Office of the Chief Scientist to provide directions for continuing the program. ISFM was found to be essential in the *NASA at the Crossroads* report. The program has been in place for ten years. He summarized the PSD work packages happening at each of the four centers. The budget is $22.9M per year. Over 260 civil servants, contractors and postdocs are supported by the program, most at a low level of support, around .10 of full time equivalency.

Ms. Meagan Thompson discussed the proposal pressure reduction of R&A proposals coming from centers, compared to all others, since 2018 when ISFM was implemented. NASA had expected to see a reduction of funds going to centers, but that didn't happen until 2020 with new requirements. Over 50% of the funds go to academia (note that the Jet Propulsion Laboratory is outside the ISFM).

Next Dr. Smith shared a few science highlights from the NASA centers, such as Goddard's ejecta mass estimates from the Double Asteroid Redirection Test impact plume, or similar high-impact results from AMES, the Life Detection Forum, and Johnson Space Center.

Q&A

Dr. Ishii really appreciated the greater detail in the R&A report and the transparency from PSD. She asked for the percent of R&A in the PSD budget, thinking of the budget guidelines of the Origins, Worlds, and Life (OWL) Decadal Survey. Ms. Thompson said it was complicated, as ISFM is not paid out of mission lines, but probably 8% of the total budget. Dr. Vander Kaaden agreed, adding that there's a lot of nuance in how that is determined. The charts Dr. DiBraccio showed will show different values than planetary R&A, with research dollars in Exploration Science Strategy Integration Office or in Yearly Opportunities for Research in Planetary Defense, or in Outer Planets; that would show up in the Outer Planet wedge in Dr. DiBraccio's chart. It hasn't changed since the PAC meeting in July.

Mr. Barbee asked what factors drive the longer notification times. If 80% of a performance measure is being met, that still means a lot of longer dates. Dr. Vander Kaaden said there are a lot of different factors, such as colleagues on parental leave or delays related to getting the notifications out with NSPIRES. For the HERA or DALI programs, it's the extensive conversations outside of general processes. NASA has struggled to find reviewers for some programs. It's clear that notifications are being made sooner for No Due Date compared to Due Date. Dr. Ishii asked how time to notification became the key metric. Dr. Vander Kaaden said the metrics were established when the NoDD program was established. This is a preliminary briefing to show a good faith effort, but there will be better information in a December 4th town hall that will walk through the data step by step.

Dr. Cable noted that PSD has less than half of proposal volume compared to pre-pandemic levels, and asked if that is part of the analysis. Does it come from reduced repeat proposals, or because people were just trying to hit a deadline? Dr. Vander Kaaden said there are a number of factors and it's hard to disentangle but if they identify trends, they will share them. Dr. Grant said, from looking at the charts, proposal pressure is down through ROSES 2023, and asked if there are specific programs where the opposite is true. Dr. Vander Kaaden said some programs are seeing an increase, such as the Lunar, Cassini or New Frontiers Analysis Programs. Dr. Grant asked if the reduction is explained by decreasing numbers of proposals from NASA Centers. Dr. Vander Kaaden said it is not. Many programs have seen big reductions, such as Emerging Worlds, which went from something like 200 to more like 40.

Dr. Cable said it was exciting to see 17 Planetary Science Enabling Facilities and asked about the metrics that will be used to evaluate them. Dr. Vander Kaaden said Dr. Burton is working on that now. Some could be extended, looking at how much time they proposed to give and what they've given, with an evaluation of community need. There are some heritage facilities and some brand new ones. It will be challenging to do a fair assessment. The initial funding period was four years. The extension could be an additional four years and then recompete, or they could

recompete in 2026. Dr. Ishii asked about the long term sustainability. Dr. Vander Kaaden said the hope is to continue to provide service to the community but also allow opportunities for new needs and monitor if some don't get the anticipated use.

Dr. Ishii asked if noncompliance was anticipated to be a major impact in FINESST for students who are learning to follow those rules. Dr. Vander Kaaden said they do outreach to help proposers get prepared, and there are extensive resources online, as well as a google drive published. Reviewers tend to be more lenient the first time. Dr. Cable noted that the selection rate is around 20% and she would choose this program to have the highest selection rate possible. Dr. Vander Kaaden said the rate was only that high because they used other funding lines, such as Mars or Discovery, to supplement the selections this year. Dr. Ishii expressed general positivity towards the use of dual anonymous reviews in FINESST.

Dr. Ishii asked about the expansion of R&A funding. Dr. Vander Kaaden said they're skipping this year of ROSES 2025 after a lot of growth. Dr. Cable asked if it would be possible to share more information on the funding allocations per program. Dr. Vander Kaaden said there is a document for every program element that could be presented in another meeting.

Starting at this time (3PM on November 12) technical issues with the WebEx platform caused intermittent audio problems for all attendees, including the notetaker.

Public Comment

The public comment period began at 3:15

From J. Whitehead via chat:

Hi, this is public comment for tomorrow's agenda, when I will be unavailable. China plans to do MSR using Long March 5 launches from Earth, which suggests a heavier Mars lander than NASA has done so far, consistent with a larger Mars ascent vehicle (MAV) than NASA's current goal. A small MAV is better for affordability, especially if multiple MSR missions are ultimately done. However, the smaller the MAV, the more likely the need for original creative engineering with more trial-and-error development, as explained at this year's Mars conference in Pasadena. https://www.hou.usra.edu/meetings/tenthmars2024/pdf/3381.pdf https://www.hou.usra.edu/meetings/tenthmars2024/eposter/3381.pdf. A related caution is that MSR is being treated as a spacecraft technology challenge within SMD, so MAV expertise remains underrepresented in decision-making. Well-represented experience from planetary and other space science programs does not include miniature launch vehicles.

Lunar Updates

Dr. Sarah Noble shared an update on the lunar science strategy in the Artemis era, including a list of activities and next steps for various studies and workshops. The Artemis II Lunar Science objectives were approved by SMD in October. The prime and backup crewmembers completed fieldwork in Iceland and the Science Officers completed classroom training. A Science Evaluation Room is under construction to be online in 2025.

Artemis III is a test flight, with multiple potential landing sites. Dr. Noble shared a map profiling the nine potential locations. There is a lot of documentation required and Planetary Data System (PDS) planning is ongoing. The landing site for Artemis IV will be driven by best science, somewhere in the South polar region. Artemis V is about testing a new lander with new infrastructure collocated with the Lunar Terrian Vehicle (LTV). Artemis VI and beyond is far enough out that NASA is still determining the architecture, informed by National Academy studies of key destinations across the moon and science objectives during the sustained phase of lunar exploration.

Q&A
Dr. Ishii thanked Dr. Noble for her presentation. Mr. Murrow asked about how Endurance A mission fits into the Decadal recommendation of long traverse. Dr. Noble said the first step is to identify the science questions – how hard is it going to be to get the rover back to the astronauts, what do we do with the rover afterwards, etc. Mr. Murrow said the SMD-led Endurance A study feels very separate from the LTV. Dr. Noble said there are two commercial teams with an autonomous vehicle, totally separate from the Endurance activity.

Mr. Murrow asked about how the leveraging or development of science ops for Artemis II, and the data archiving, was cooperating with other data. Dr. Noble said Artemis is so different from working on the space station. There are a lot of analog studies. There is a new console position of Science Officer who will sit next to the person running the task to collaborate back and forth, which involved training everybody in the chain in geology so everybody is speaking the same language. Three science officers are getting ready now. Mr. Murrow asked if those people are members of the community. Dr. Noble said the science officers are lunar geologists from NASA, learning to speak the language of the flight console folks. Doing science in real time, and doing geology, is different than conducting an experiment on the space station. Even in terms of data sharing, Artemis III is going to have a lot more sources of data.

Dr. Ishii asked if there was any resiliency planning for such a long duration program. Dr. Noble said they've enjoyed broad support and believe they have a good community of people to carry the work forward over time.

<u>ESSIO Updates</u>
Dr. Joel Kearns provided updates from the Exploration Science and Strategy Office. NASA's decision to terminate VIPER was the biggest disappointment in the past quarter. In response to the request in August there were 50 expressions of interest. They ranged from a partnership to a museum. NASA then issued an RFI for Partnership and got 10 responses. There typically wasn't enough information to give NASA a sense of the realistic cost and schedule or risks.

The Lunar Trailblazer spacecrafts and instruments completed testing and the operational readiness review. The planned launch is quarter 1 of 2025 as a ride share on the Falcon 9 that will launch the Intuitive Machine-2.

The next CLPS missions likely to launch are the Fireflies first mission to Mare Crisium in the fourth quarter of 2024 with 10 instruments onboard, and the Prime2 Intuitive Machines Nova-C in the first quarter of 2025.

Recent selections include Lunar Mapping Program (LMaP) and Development and Advancement of Lunar Instrumentation (DALI). Dr. Kearns also profiled upcoming lunar calls and community studies. LMaP is a pilot program but may become annual if it goes well.

Future CLPS include CT-3 in 2025 from Blue Origin, which is headed to the South Polar Region, and CP-22 from Intuitive Machines in 2027, also headed to the South Polar Region.

According to the Origins, Worlds and Life (OWL) recommendation, the Endurance A should be implemented as a high priority strategic medium class mission. NASA is convening a South Pole-Aitken Basin Sample Return and Exploration Science Definition Team to prioritize science objectives and evaluate implementation approaches, as well as develop the Science Traceability Matrix to recommend one nominal mission concept. Ryan Watkins is the NASA Point of Contact for anyone interested.

Finally, on the Lunar Reconnaissance Orbiter (LRO) instruments are actively collecting data for ongoing science investigations as well as supporting upcoming CLPS deliveries and international lunar exploration. Launched in 2008, the LRO is preparing to submit a proposal for its 6th Extended Science Mission (October 2025-September 2028).

Q&A
Dr. Cable asked how the management of ESSIO works. Dr. Kearns said that VIPER and Lunar Trailblazer are both funded under ESSIO and are managed by Planetary Division day to day, funded by the Lunar Discovery and Exploration Program.

Dr. Cable asked if the VIPER team was offered any emotional support, as has been done in the past (such as Cassini), and if this is something NASA is planning for given the higher risk future missions. Dr. Kearns said the team is focused on finishing out the activities they have budget for in 2025, and they want to see what the partnership results are and what people's participation might be. What team support is provided will be dependent on that. There's a perception of risk on these commercially driven missions, it's more like taking shots on goal.

Dr. Grant asked if there was a timeline for the partnership expressions of interest. Dr. Kearns said no. It's not clear if the team would stay in place, that would be up to the proposers.

Mr. Murrow asked for an update on the CLPS lander that would have delivered VIPER, which was still going to be flown pending a final decision. Dr. Kearns said the Griffin Lander has a new type of engine and there is interest in testing that on a large lander that could take more instruments on a mission, such as if CLPS takes Endurance A to the South Pole. They are in discussions to either send a mass simulator or have a smaller sized payload if one is identified, but not add anything that increases the cost to NASA. Mr. Murrow asked if there was a schedule

for the final decision. Dr. Kearns said since the Peregrine failure, Griffin 1 would fly no later than September 2025. VIPER had specific landing window requirements that are no longer relevant with a mass simulator.

Mr. Murrow asked if the experience has resulted in cost savings that the rest of ESSIO can use. Dr. Kearns said that rather than saving money, NASA avoided accruing more costs that would have had to be provided by cancelling other near term activities. VIPER was very late and was not going to be delivered by August 2024 to be integrated into Griffin. VIPER had major long delays in components. There was redesign. The team quite heroically tried to fix things that were coming in, but all the money got burned up and they weren't going to make their landing date. The next window was September 2025, but there was a cost to continue it. There had not been a plan for anything other than launching VIPER in 2024. Griffin was a firm fixed price so there were no costs associated with that. We've learned a lot about fixed price contracting and high risk missions.

Additional PAC Discussion

The PAC discussed potential findings related to the VIPER cancellation, such as the necessity of keeping the rover intact and taking no irreversible action until the science community can weigh in on scientific value and cost/benefit considerations, using similar language to the NAC Science Committee. There was also discussion of a contemporaneous workforce reduction of about 5% (325 people) being announced at JPL. They asked Dr. Kearns if such a recommendation would have any use. Dr. Kearns said he does not weigh in on what the PAC should issue as a finding or bring to the NAC, adding that the team learned a lot from VIPER interacting with the firm fixed-price CLPS model. It was instructive how intertwined a large system was with the mission design. The traverse was intricate and the rover could only land certain days because it's photovoltaic and can't survive a 14-day lunar night. Because the mission was so constrained, delays compounded. One lesson learned is about the limited landing dates in certain regions depending on the time of year, particularly if there must be lighting and heat and direct earth communications without comp relays. Mr. Murrow observed that Discovery has tried to do pretty complicated landers and there are some lessons learned with the CLPS approach that were anticipated in some of the Discovery proposals. One of the lessons is that the fixed price contract doesn't remove the complexity. It's in nobody's interest to have a cancelation with no money saved.

The PAC discussed a restatement or expansion of the past finding and recommendation on the Moon to Mars and Mars Sample Returns. In addition, the PAC expressed appreciation for inclusion plans but also an ongoing need for support and resources. They discussed a finding without a recommendation on the planetary science conference, encouraging community input and a meeting abstract archive. They discussed the benefits of having an RFI and calls for mission participation in internships like ICONS and the H2O Program. Finally they suggested a humorous finding of not using WebEx for virtual meetings, given the technical issues earlier in the day.

Dr. Cable asked if there is a potential finding associated with Clipper MOSFETs (metal-oxide-semiconductor field-effect transistors – which, after launch, were found not to meet the radiation hardness standards of the mission) or if the PAC should ask to hear more from PSD at the next meeting. The PAC is interested in the tradeoff of cheaper/faster/better. Dr. Prockter said it's a new CLPS provider and that the workforce on Clipper would tell you they did all the testing that was required. Dr. Danielson suggested reviewing the OIG report before issuing a recommendation.

Dr. Kiefer noted that there are parallels between VIPER and MSR. If there's nothing actionable, the PAC can express a concern on budget overruns and cuts on the flight project schedules. A finding on CLPS should not be at odds with the finding on MSR. How should NASA deal with overrunning budgets, given that missions developed during Covid-19 had big problems. Dr. Curry preferred two separate findings or recommendation, noting that the PAC is the advisory committee most invested in VIPER and in the science it would have done.

Dr. Ishii thanked the PSD members, presenters, PAC members, Dr. Robinson, the support staff, and the community, especially for their patience and assistance during the tech problems.

The first day of the meeting adjourned at 5:50 PM ET.

Day 2
Dr. Ishii reconvened the meeting for the second day at 10:02 AM and reminded Committee Members of the conflict of interest policy.

Dr. DiBraccio provided a staffing update: Dr. Lori Glaze will be permanently remaining as the Deputy Associate Administrator. Dr. DiBraccio herself was also on a detail that cannot be extended. The new Acting Director is Dr. Webb and the Acting Deputy Director will be Dr. Curt Niebur once Mr. Eric Ianson retires on Dec 31st. The permanent Director is TBD because there is a moratorium on SES directors.

Dr. Cable asked who is filling in for Dr. Niebur. Dr. DiBraccio said he will be wearing multiple hats.

Dr. Ishii thanked Dr. DiBraccio and Dr. Niebur, and Dr. Curry added thanks to Dr. DiBraccio for her service since this will be her last meeting with the PAC.

<u>PSD Flight Missions Update</u>
Dr. Shannon Fitzpatrick reviewed the planetary fleet and provided updates on Europa Clipper, which launched on SpaceX Falcon Heavy from Kennedy space center. She offered congratulations to everyone involved in the launch and mission.

NEO Surveyor is progressing towards Critical Design Review in Feb 2025 and is on plan to make their launch readiness date (LRD) in September 2027. Lunar Trailblazer's launch readiness date has moved to no earlier than January 2025 but has been able to replace the main engine within the schedule margin and passed an Operational Readiness Review in October.

In New Frontiers Missions, the level, caliber and quantity of samples OSIRIS-REx brought from the asteroid Bennu is phenomenal. They contain the original ingredients that formed the solar system, carbon and nitrogen, as well as organic compounds. The samples are showing abundant magnesium-sodium phosphates, which were not detected during remote sensing. Bennu may have splintered off from an ancient primitive ocean world. One mystery is that the samples show a history of being wet – the team is trying to unravel this. Dragonfly is the next large PSD mission. It has been confirmed April 16 and proceeded to Phase C. The launch readiness date is July 2028. There's a press release coming soon about the launch vehicle procurement.

Juno is in extended mission phase through 2025 and seeking further extension. Juno just completed its 66th pass around Jupiter and Io.

New Horizons, which was launched in 2006, just re-entered hibernation mode as it travels through the Kuiper belt.

Dr. Fitzpatrick then reviewed the current Discovery Missions. In the Psyche mission, the Deep Space Optical Communications (DSOC) system transmitted a message that exceeded expectations from a distance of 460 million kilometers. Psyche will receive a Mars gravity assist in May 2026 and will arrive at Psyche in August 2029.

On the DAVINCI (Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging) mission, Dr. Fitzpatrick offered commendation to the team for continuing to maximize the development and risk reduction, doing as much as they can moving forward with what they've been provided. They're also doing a lot of outreach to the next generation.

The VERITAS (Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy) project will launch no sooner than 2031, but is continuing monthly science team meetings.

The VenSAR (Venus Synthetic Aperture Radar) project is anticipating a Preliminary Design Review in September 2025, contributing to ESA's understanding the geological evolution and state of Venus surface.

Looking ahead, Dr. Fitzpatrick shared that two new teams have been added to the Here to Observe program, Kutztown University with CSU Channel Islands. This program is in NoDD/ROSES. More missions and university teams could be added in the future.

<u>Q&A / Discussion</u>

Dr. Cable thanked Dr. Fitzpatrick. She asked how much time remains on Lunar Trailblazer after the hard work of swapping out the engine is complete, and what risks are ahead. Dr. Fitzpatrick said the team did eat through the margin but then there was an LRD slip due to Innovative Machines, so they're complete in a holding pattern. Of course they also have to develop new trajectories and simulations as a result of the change.

Dr. Ishii asked about lessons from Clipper MOSFETs. Dr. Fitzpatrick said the current focus was on the launch while lessons learned are ongoing. As was discussed in the previous PAC meeting,

the MOSFETs investigation is on the whole aerospace community now, of which NASA is just a small group. The parts did pass the military specification and were certified parts when they were received. The question is, should the specification be changed, and should the testing program be changed to avoid the surprises experienced on Europa Clipper. The decision was made a decade ago to use these spec parts rather than ones that are custom made, with a unique large testing program, which would have cost millions. It was the right decision because NASA is able to exonerate the MOSFETs. The Office of the Chief Engineer, working with JPL, is actively engaged with the rest of the aerospace community. Dr. Fitzpatrick said she will report back to the PAC as conversations develop. Dr. Ishii said she looks forward to that update at the Spring meeting, and particularly how the lessons are disseminated. Dr. Fitzpatrick added that she wants to give kudos to the MOSFETs investigation team at JPL/APL (Jet Propulsion Laboratory / Applied Physics Laboratory) for the diligent, systematic investigation to determine if the system was okay to fly – they deserve all the credit.

Dr. Ishii asked about Dragonfly and the concerns about cost overruns, with the hope of avoiding the problems of these other missions. Dr. Fitzpatrick said Dragonfly is a Category 1 mission with a lot of attention on it. There have been overruns, but NASA changed their profile three times due to budget constraints. That creates additional costs, which is what is now being seen. NASA is working closely with APL, including a meeting tomorrow, with a first quarterly review on December 6th to review progress and status. They're under full Earned Value Management (EVM) now, they conducted their Independent Verification Review. There is a whole team watching closely and the goal is to catch things early. The PSD budget is fragile so there's a vested interest in keeping to planned costs in order to avoid hard problems.

Mr. Murrow asked about funding for the spacecraft teams on VERITAS and DAVINCI, saying it's great that the science team has gotten funding, but he recalled Dr. Kerns talking about the complex interaction between the mission and payload. Is NASA making the assumption that the spacecraft team will come up from a standing start whenever we're ready to go, or are they maturing along with the science? Dr. Fitzpatrick said there is funding for the spacecraft and the long-lead procurements. It's a balance. The funding profile for VERITAS right now supports an operational phase for 2031 and beyond. But if it's going to be 2031 and not 2033 they need funding. Mr. Murrow thanked Dr. Fitzpatrick and wished everyone luck with a real Venus program.

Dr. Cable asked about cross pollination or synergies not just between DAVINCI and VERITAS but also EnVision. If VERITAS shifts to 2032 would they be aerobraking within ten days of each other in 2033? Envision is not run through DSN. Dr. Fitzpatrick said SMD has been collaborating to understand capabilities and resource loading to be able to support all the missions at the times we need them supported. They understand the needs for the Venus missions right now and they have them planned. Bill Knock is the point of contact.

Dr. Curry said she wanted to ask more about inclusion plans, but also raised a potential conflict of interest as the Primary Investigator (PI) of a mission that is involved in senior review. Dr. Ishii expressed that there's no financial stake and merely asking the question does not represent a conflict of interest. Dr. Curry said the inclusion plans in R&A and ROSES are optional, but the senior review process has an inclusion plan that was not in the draft, so missions didn't have the extra time to prepare and don't necessarily know what resources are available. Dr. Fitzpatrick said she takes the blame for that; the directorate was moving them forward in every subsequent review across divisions so she made the suggestion to put it in. Dr. Niebur said there are a fairly standard set of resources for proposers and they're in transition for flight projects. Dr. Curry noted that if there is going to be something mandatory in something as large as the senior plan, NASA should move forward slowly and thoughtfully. Dr. Nahm added that as the lead for the inclusion plan community of practice, that is completely separate from the flight project AO, but a lot of it is similar to the requirements of ROSES. There are resources on the SARA page (of Science.Nasa.Gov).

Henry Throop shared that these inclusion plans are part of the proposal and feedback will be provided to the missions but it's not part of the overall score of the senior review and will not affect the evaluation of the rest of the proposal. Dr. Curry thanked him for that clarification and said that was a thoughtful way to proceed. Dr. Nahm said that is also the process in ROSES - it doesn't affect selectability. Proposers are being asked to practice writing these plans, and to think about them for maybe the first time.

Dr. Ishii asked if there are links in the final senior review call. Dr. Fitzpatrick said yes. Dr. Ishii wondered if this was a matter of advertising, since there is a dedicated website and some workshops held. This could be a finding. Dr. Jessup suggested both thanking staff for creating the resources and for continuing to make those resources present, as well as encouraging continually promoting them.

Dr. Cable wanted to provide clarification on a previous question on deconflicting EnVision and VERITAS, since not everything is flexible, NASA could end up in a sticky situation if they can't be deconflicted in time. She just wants to make sure everyone understands the fragility of the system. Dr. Fitzpatrick said she would take that back to the team to walk through and troubleshoot. Dr. Niebur noted that the DSN will have to address this.

Dr. Ishii wondered if it would be valuable to issue a finding with no recommendation on Dragonfly's cost overruns, and ask for more details. Dr. Curry said it might also make sense to wait and see what percolates to the top. There's no datapoint in front of the PAC for a finding.

<u>Mars Exploration Program Updates</u>

Mr. Eric Ianson and Dr. Lindsay Hays presented on the Mars Exploration Program and provided an overview of recent and upcoming meeting dates. Operating mission senior review proposals are due December 18 and Mars Data Analysis Program Step 2 proposals are due November 14. MAVEN celebrated ten years in orbit on September 21st. Mr. Ianson shared staffing updates

within the Mars exploration program; Mr. Ianson is retiring and Charles Webb will be the new Acting Director and the Acting Deputy Director will be Dr. Niebur once Mr. Ianson retires on Dec 31st. However, the Mars Exploration program will be broken out separately. NASA is working on their strategy for that position. Mr. Ianson thanked retiring Ramon de Paula and Dave Laverty.

Mr. Ianson provided an update on the status of the Mars Explorer Program (MEP) Future Plan. It is in final review at NASA HQ and will be released shortly, hopefully just prior to the American Geophysical Union (AGU) Fall Meeting where there will be a special session to roll it out and discuss it.

Mr. Ianson discussed technology priorities, which are wide-ranging. The President's FY25 budget request includes a $40M increase for the MEP technology budget. The plan calls for a combination of directed projects at NASA Centers and competed projects.

Mr. Ianson provided a status update on 12 commercial studies to assess cost, feasibility, technology maturity for Mars science-enabling services. The MEP team is currently synthesizing the results. There's significant interest from the commercial sector to be involved and the potential to meet some of NASA's needs, particularly in infrastructure.

On the Rosalind Frankling Support & Augmentation (ROSA) project, Mr. Ianson shared that the project is now in Phase B (Formulation) with good progress. An MOU with ESA has been signed to expand the NASA contributions – adding launch services, breaking element, and radios to heater elements.

Dr. Hays presented on the progress of the Sample Receiving Project, the last stage of the Mars Sample Return, which is being managed in partnership with ESA. She also provided an overview of the Mars Science Laboratory; in 12 years, Curiosity has drilled 42 samples and climbed 832 meters. The rover has reached Gediz Vallis, a priority location, and discovered a rock made of elemental sulfur. This is the first time that has been seen, and the formation process is not clear. It's very exciting. She also shared updates on the current crater rim campaign.

On Orbiter science, Dr. Hays described the work of the science team members investigating what seems to be a new gully on Mars through ExoMars Trace Gas Orbiter, using data between Mars Reconnaissance Orbiter's high-resolution imaging science experiment and Color and Stereo Surface Imaging System (CaSSIS). In Mars Odessey, Thermal Emission Imaging System (THEMIS) data has been used to search for layered ejecta craters that may signal the presence of water. The Mars Odyssey Orbiter has finished 100,000 orbits of Mars in 23 years and the Mars Atmosphere and Volatile EvolutioN (MAVEN) mission has been operating successfully for 10 years.

Finally, Dr. Hays profiled the Mars Surface Science Workshops as well as a virtual seminar and on the Science and Planetary Protection in Advance of Human Exploration and a workshop on Methane at Mars (point of contact: Becky McCauley Rench).

Mars Sample Return Updates

Dr. Jeff Gramling briefed the committee and welcomed Dr. Hays to her current role. On the Mars Sample Return, the team was midway through Phase B when it became apparent that they needed to pause and do a deep dive, and a second program IRB. Perseverance continues to do great work to bring us compelling samples, and now the complex round trip mission to Mars to go to the surface,

Dr. Gramling reviewed the return campaign architecture. Following the delivery of the Internal Review Board (IRB) report in September 2023, Dr. Fox established an SMD level group led by Deputy Associate Administrator Sandra Connolly to consider the recommendation and develop a response, which was delivered on April 15, 2024. It was decided more needed to be done to flesh out the good ideas amongst industry and the centers.

The MSR IRB Response Team (MIRT) recommendations were to revise MSR mission design with improved resiliency, risk posture, and reduced complexity, with a list of associated tasks. The mission will transition from JPL to headquarters. The other recommendation was to evaluate the Mars Ascent Vehicle and the Mars Orbiting Sample system, adding a Radioisotope Thermoelectric Generator, and remove the helicopter. The $8-$11 billion; phasing the Sample Retriever Lander and Earth Return Orbiter missions to the 2030s as a result sample return in 2040.

Dr. Gramling said the Mission Studies reports are in hand and are being evaluated; 12 were selected. An external team is reviewing and making “go-forward” architecture. The team is doing what they can to reduce the complexity, bring in experts, and reach a plan everyone is confident in.

Dr. Hays was presenting from Norway where she was meeting with colleagues on the MSR analogue collection. Samples from earth are being selected to represent the Martian samples so that researchers will be prepared to conduct their analysis when the real samples are returned. The homogeneity of the samples was important, to ensure that one group of samples is similar to the other. Dr. Hays profiled the Analog Sample Library. The next step is to supplement the collection with additional samples and match them to various criteria so the analog collection represents the Perseverance cache.

One other activity of the Science Group is to work from the science objectives (set before Jezero crater) to the sample receiving facility science goals. Dr. Hays noted that the value of the science in the return samples is high regardless of changes to schedule and architecture. It’s the result of five decades of work. There’s incredible in situ information for each sample. This work is to ensure the samples are available for the global science community.

Q&A/Discussion

Both Mr. Murrow and Dr. Cable offered thanks and kudos to the presenters. Mr. Murrow asked if NASA has considered the cash flow of the commercial sector; not just enthusiasm and capability,

but the ability to fund program start-up and to survive before things get paid for. Mr. Ianson said part of the goal of the commercial studies was to ask for industry perspective. When NASA speaks about public-private partnerships, it might not be just about industry putting the money up front, it could be a blended model. The goal is to reduce costs but also ensure things are profitable for industry. The studies didn't provide all the answers, but it came up. It may not make sense for NASA to be the only customer.

Mr. Murrow asked if the lessons learned from VIPER and the CLPs were being incorporated. Mr. Ianson said yes. It's not a one-to-one analogue in terms of what's applicable and what are the right lessons.

Dr. Cable asked for expansion on the topic of commercial infrastructure. Mr. Ianson said he was thinking of High Resolution Imaging Science Experiment (HiRISE); there's a lot of similar imaging on earth that's commercial. How can NASA leverage those capabilities to moon and Mars? The other key element is Mars Relay Network. We frequently get findings concerned about the age of the infrastructure at Mars. Commercial could be one way to approach that, but it's not the only way. Can we leverage opportunities with our own systems and international systems to do things cheaper? Dr. Cable asked what the implications are for the workforce, if that expertise is being distributed from NASA centers. Mr. Ianson said it's a balance, but NASA doesn't compete when there's commercial capability. They put internal money in the budget ($30mil out of $40mil) to ensure NASA maintains expertise.

Dr. Grant referred to the presentation from Dr. DiBraccio on the Mars Participating Scientist Program (PSP). The 2020 program was halted, the Mars Science Library (MSL) program is competed only for MSLPS in a closed competition, there doesn't seem to be much info about a Rosalind Franklin PSP, and the Mars Data Analysis Program (MDAP) program in R&A has increasing rather than decreasing proposal pressure. The PS programs bring in new blood. With Perseverance transitioning to new phases, PSP is a reasonable way cost wise to bring people in when there's not a lot of new opportunities. Mr. Ianson said PSPs are an important and valued element of the Mars program. The team has to make judicious decisions about where to apply resources on the science and R&A side. They are relatively small dollar value. The budget is tight. Dr. Hays added that there's value to having a robust Mars science community and this helps us add new people. The MDAP is a great way to see a long tail in the science return from our missions. Dr. Grant asked if there is money for Mars Science Library Participating Scientists, why not open it up to the broader community? Mr. Ianson said he'd have to get back to the PAC on that. Dr. Grant expressed appreciation. Dr. Prockter said she wanted to echo the importance of Participating Scientist Programs when missions are few and far between.

Mr. Murrow asked how the team is managing the end of the Perseverance traverse when the lander for the sample return is still years in the future. Dr. Hays said the architecture is under consideration right now. The handoff is inside Jezero in the reference architecture, but there's the possibility of doing something else. Dr. Gramling agreed, saying to stay tuned; as the

architecture comes together there will be more to say. Mr. Ianson added that the goal is to maximize the potential of the rover. Once there is a clear path for MSR, there will be a lot of discussion on the strategy of Perseverance. It's a complex issue, to deliver the samples and also continue to maximize the use of the rover. Dr. Gramling clarified that these were foreseen planning points and they are codified in the Notice of Award so there has been thought on this. Mr. Ianson added that MSR and MEP are separate programs but don't make separate decisions, working closely together. Dr. Hays noted that her role is also cross divisional.

The final comment was from Dr. Ishii, saying that the Mars Surface Sample workshops were really great.

Public Comment Period
Dr. Ishii opened the public comment period.

M. Elowitz said: *Comment only: I wonder what the future of the MSR mission and lunar exploration will be given that there will be a completely new administration in Washington, D.C. come January 2025. Will there be a new NASA Administrator?* Since this was a comment only, the PAC did not respond.

C. Gary-Bicas said: *This is for Dr. Hays: Is MCSG looking for contributions for the analogue library and/or will there be any funding opportunities external to the MCSG to contribute to the library?* Dr. Hays said if someone has a location in mind they think is a good analog, Michael Thorpe leads the rock team, which has a number of criteria about the access and homogeneity: Michael Thorpe michael.t.thorpe@nasa.gov.

Dr. Rebecca (Becky) McCauly Rench returned to a prior question about adding new participating scientists to the PSP as an opportunity to grow the community. Dr. McCauly Rench is the MSL Program Scientist and oversees the PS program. She shared that they did a fully open call in 2021 using Dual Anonymous Peer Review, with three year awards, now coming to an end. Instead of holding a new open call they decided to renew the class due to funding levels. With an open call, the funding would have significantly reduced the number of scientists. Dr. Prockter asked if the cost of running the call would have detracted from the slots. Dr. McCauly Rench said the cost of onboarding results in smaller awards, losing about 10%. It would have been 18 scientists instead of 20. The cost of onboarding is substantial compared to the cost of continuing. Dr. Kiefer asked if that is training operations roles. Dr. McCauly Rench said yes, and bringing people into the secured missions systems, badging requirements, IT support, trainings. The PS awards are not high amounts, between $50-100K per year. Dr. Cable asked if the costs are because of the new cyber security protocols. Dr. McCauly Rench said that is one component. Previously new scientists didn't have to get badged to participate in operational. But now they do, with badging appointments and travel all rolled in. In the previous cycle it was 50/50 between early and new career scientists.

J. Radebaugh commented, *In case this is the public comment period: I think there is a need to consider how to improve ANSMET access to the deep field. Right now the NSF is not able to support the group very well, participants typically spend several to up to four weeks in McMurdo each season. Perhaps they could decouple from NSF? Contract directly to Kenn Borek Air?*

S. Pathirana commented**,** *When we bring samples from Mars to the Earth, we keep them away from their natural environment. Doesn't this change the composition of the soil sample?*

M. Elowitz commented**,** *Comment Only - No need to respond: I assume it is typical for NASA to only answer questions or respond to comments that they see fit, or as a form of an agency protection mechanism ;-)*

Dr. Ishii made the point that the PAC is external and not an official NASA body.

Assessment/Analysis Group (AG) Updates

Dr. Ishii gave instructions to the AG presenters prior to the start of this section.

Lunar Exploration Analysis Group (LEAG)

Dr. Benjamin Greenhagen noted that the way the VIPER program was communicated was difficult for people. He shared recent and upcoming activities including the 2024 Annual Meeting. The top preliminary findings at the meeting were (full AG findings for all groups are publicly available):

1. LEAG encourages the reconsideration of the overwhelming value of VIPER science objectives to science, exploration, and technology and advocates for operating the VIPER mission as soon as practical.
2. LEAG strongly encourages NASA to pursue a balanced approach for scheduling ground contacts appropriate to execute prioritized science observations and ensure LRO spacecraft health.
3. LEAG encourages NASA to provide a rubric to the community for the evaluation of Inclusion Plans by the end of the first quarter of 2025 in advance of ROSES-2025 proposal submission dates and to ensure that all Inclusion Plans are evaluated and receive feedback, regardless of their ranking in the Dual Anonymous Peer Review (DAPR) process.
4. LEAG encourages a reevaluation of the PRISM solicitation cadence in conjunction with the development of a strategic PRISM roadmap.
5. LEAG encourages NASA to expand engagement with the science and exploration communities and provide additional opportunities for input and direct involvement at multiple points within the Moon to Mars Architecture Definition Document (ADD) process.
6. The LEAG Commercial Advisory Board (CAB) identified findings in three topics: (I) Commercial Lunar Payload Service (CLPS) support and expansion, (II) Increased communication and discussion on projected commercial opportunities, and (III) Consideration of commercial support for achieving lunar science goals.

7. There were 8 lower-priority preliminary findings (total of 14) that were also shared with the PAC.

Mapping and Planetary Spatial Infrastructure Team (MAPSIT)
Dr. Julie Stopar shared updates on the staffing, workplan and, goals, and shared the following recent findings:

1. Geologic Mapping: MAPSIT encourages opportunities for geologic mapping as a critical component of planetary exploration in advance of upcoming missions as much as possible
2. Software and Tools: MAPSIT sees a community-wide need to discuss and identify critical software gaps for planetary data analysis
3. Training and Accessibility: MAPSIT endorses NASA's ongoing efforts to support researchers and promote training and accessibility in the Planetary Data Ecosystem.
4. Coordinates and Reference Frames: MAPSIT appreciates and encourages agency-level group discussions of the type recently completed for the lunar coordinates and reference frame (R. Fergason et al., presented at LEAG Oct 2024).
5. Planetary SDIs: MAPSIT encourages continued support for planetary spatial data infrastructures.
6. Spatial Control: MAPSIT encourages intentional and coordinated support for high-quality spatially-controlled data to use as a basis for a wide range of high-priority science and exploration endeavors.

Venus Exploration Analysis Group (VEXAG)
Dr. Debra Buczkowski reviewed the prior findings since VEXAG has an upcoming meeting schedule that includes a Sunday session to better accommodate the community's needs. She shared the message that the VEXAG community is unified in its support of all upcoming Venus missions, recognizing that these are challenging times. VEXAG urges NASA to take all factors into account; science, budget, programmatics, etc., in the decision-making process to guarantee maximum returns from both of its selected missions VERITAS and DAVINCI, as well as EnVision and other Venus endeavors with agency participation.

Mercury Exploration Advisory Committee (MExAG)
Dr. Stephen Parman, vice chair of MExAG shared ongoing findings and notes on the BepiColumbo IDS/GI Program and Mercury Flagship Mission Concept Study:

1. MExAG encourages NASA to work with its international partners to secure the opportunity for U.S. participation in any future BepiColombo IDS/GI calls run by ESA and/or JAXA. Given that the BepiColombo nominal orbital mission is slated to begin in November 2026, support for the Guest Investigator Program is time-sensitive and should not be postponed.

2. MExAG encourages NASA to initiate a directed study of a candidate Mercury Lander flagship mission concept. This study would help to ensure a well-developed Mercury flagship mission concept is ready for the next Decadal Survey.

In upcoming activities, they are planning an in person meeting in February and preparing a science goals document. The last two flybys of BepiColombo will continue as planned, although orbital insertion will be delayed by 11 months.

Small Bodies Assessment Group (SBAG)
Dr. Joe Masiero shared updated membership and conveyed SBAG's appreciation of PAC's Summer 2024 DSN recommendation, which is echoed in previous and current SBAG findings. He shared three findings from SBAG's July meeting:

1. SBAG strongly encourages NASA to make every effort to keep the Near-Earth Object (NEO) Surveyor space telescope on schedule.

2. SBAG continues to encourage NASA to find a launch opportunity for Janus that supports compelling science.

3. SBAG strongly advocates for NASA's involvement in the full timeline of investigation opportunities that the close Earth approach of asteroid 99942 Apophis (2004 MN4) affords the scientific community in 2029.

In conclusion he expressed enthusiasm for the Janus RFI to the asteroid Apophis.

Exoplanet Program Analysis Group (ExoPAG)
Dr. Diana Dragomir reviewed the monthly call schedule, saying EXoPAG is currently focused on implementing community suggestions, particularly reaching out to minority serving institutions and making sure they receive EXoPAG emails and newsletters. They are in the final stages of producing the Exoplanet Exploration Science Gap List and their next meeting is at the EXoPAG 31 meeting at the winter conference of the American Astronomical Society, with seven speakers giving early career talks.

Mars Exploration Program Analysis Group (MEPAG)
Dr. Vicky Hamilton presented on the draft findings from MEPAGs meeting the week prior. just had a meeting last week and shared draft findings.

1. MEPAG reiterates strong community support for selecting an MSR architecture that returns 30 samples expected to be onboard the Perseverance rover when a retrieval lander arrives.
2. Given that all of NASA's Mars orbital assets are over a decade old and well beyond their design lifetimes, combined with the urgent need for modernization of the Deep Space Network to ensure the return of large data volumes from Mars, MEPAG remains deeply concerned about infrastructure at/supporting Mars and

strongly backs NASA and MEP efforts to address these critical needs.

3. MEPAG finds there are a variety of promising lower cost options for engaging the commercial sector in areas of needed infrastructure support and science at Mars. This approach may reduce programmatic risk but also may pose higher risk to individual scientists' careers if failure rates are higher than typical for MEP missions.
4. MEPAG is pleased that NASA has begun coordinating a Mars Surface Science Workshop series and encourages its continued growth at a rate that meets the ongoing needs of the community and Moon to Mars program; this series will serve to facilitate and expand conversations between science, human spaceflight, and other interested parties invested in Moon to Mars architecture planning.

Extraterrestrial Materials Analysis Group (ExMAG)

Dr. Philipp Heck, the new ExMAG Chair, thanked outgoing Astromaterials Curator Dr. Francis McCubbin. He profiled the upcoming ExMag Annual Public Meeting in May 2025, immediately followed by the ExMAG/MEPAG Workshop, Connecting Community Scientific Hypotheses to Mars Sample Science.

Outer Planets Assessment Group (OPAG)

Dr. Carol Paty shared that OPAG has five new steering committee members and a change of leadership, as Dr. Amanda Hendrix stepped down. Dr. Paty and Dr. Cable of the PAC will be co-chairing moving forward. Next meeting is next week. Dr. Paty shared finalized findings from June 2024:

1. New Frontiers 5 Timeline and Target List: a) OPAG strongly supports NASA's current plan to provide a community announcement describing NF5 Announcement of Opportunity (AO) parameters in the Oct-Dec of 2024 timeframe, which is 18 months ahead of the planned AO release in Q3 FY2026 (Apr-June 2026). It is critical, in the interest of the community, for NASA to stick to the announced schedule without further delays. b) OPAG strongly supports the decision to have CAPS revisit the NF5 target list due to the multiple delays in the AO and due to new developments since the Decadal Survey. We urge NASA to include Triton, along with the other outer planets targets, on the NF5 list, in line with the Decadal Survey intentions. A Triton mission concept was placed on the NF7 list in OWL solely based on the assumption that a trajectory would only be achievable in the then-presumed NF7 timeframe, but the schedule delays (and new trajectory work) have invalidated this assumption.
2. Uranus Orbiter and Probe Start: OPAG strongly encourages NASA to commit to starting formulation studies for the UOP mission activities in FY27 as indicated in the FY25 President's budget request. The would be consistent with Decadal Survey recommendations, and arrival at Uranus close to equinox (2050) would maximize the science return on the mission.
3. RPS Program – NGRTG Readiness and Performance Metrics: OPAG thanks NASA and the RPS Program for their continuing efforts to prepare RPSs that are critical for high

priority future missions without alternatives, especially for outer planets missions, including UOP. OPAG requests NASA to assess the readiness and performance metrics of NGRTGs, and potentially make this capability available for technology infusion on missions launching after 2030.

4. Resources for Upcoming Stellar Occultations Observations of Uranus: OPAG requests that NASA prioritize resources (e.g., ROSES programs such as the Solar System Observations (SSO), NASA Keck time, IRTF) to observe the upcoming stellar occultations by Uranus on April 8, 2025, February 15, 2031, October 9, 2031, and February 6, 2032. February 15, 2031 provides a once-in-a-century opportunity to measure the Uranian upper atmosphere from Earth due to the occultation of an exceptionally bright star.
5. Supporting HST Data Analysis for Solar System Science: OPAG emphasizes the importance of HST as an asset for critical solar system science observations. Due to severe cuts in funding for HST users in recent observing cycles, OPAG requests that PSD look into the appropriate solution to adequately support HST data analysis,perhaps by allowing more liberal use of HST data in ROSES proposals than currently allowed, including the use of archival (AR) data.
6. Exploring Opportunities to Utilize Super Heavy Lift Launch Vehicles: If super heavy lift launch vehicles are being or will be produced at a cadence faster than they will be used, this may present a real opportunity for planetary missions. OPAG encourages NASA to study use of these potentially very enabling capabilities for planetary purposes including UOP. OPAG requests that NASA work to make available its assessment of notional super heavy launch vehicle offerings by NASA and industry and anticipated costs to SMD on a timeline that would allow them to be considered for future PSD missions, and report the findings to OPAG at a 2025 meeting.

Ocean Worlds Working Group (OWWG)
Dr. Mike Bland shared a progress update of the first 12 months of OWWG. They have met with community groups to formulate high level science questions and are developing traceability from these science questions to mission architecture and instrument development. The questions they have established are:

1. Which outer solar system bodies contain liquid water in their interior?
2. How do Ocean Worlds form and evolve over time?
3. Do Ocean Worlds have past or present environments suitable for life? Which Ocean Worlds are habitable?
4. Does past or present life exist on Ocean Worlds?

OWWG Leads will be reaching out to subgroups for input on the draft traceability before release to the broader community

Cross-Divisional Equity, Diversity, Inclusion and Accessibility Working Group (EDIA XAG)
Dr. Julie Rathbun invited all other AGs to join the EDIAXAG listserv. The group has new

leadership and an upcoming speaker series hosted on the website. Their new workshop is Feb 11-13, 2025.

Q&A/Discussion

Dr. DiBraccio reiterated updates on the PSD leadership plan. Dr. DiBraccio's own detail is also ending and she will be going back to Goddard. Deputy Director Charles Webb will be stepping into be acting director position. Dr. Webb introduced himself to the committee. He was on prior detail as Associate Director for Flight. The focus right now is to provide continuity of leadership. Dr. Fox is hoping to announce more around the AGU conference. Dr. Ishii expressed the Committee's concerns around the hiring moratorium and leaders taking dual roles, as well as the limitations for an inclusive environment. Dr. DiBraccio said it has to do with the timeline to name the next Administrator, which is unknown.

Dr. Cable recused herself from any OPAG discussions as a member of the AG.

Dr. Ishii asked if the LEAG thought there would be value in having a comment period for the community on the VIPER partnership. Dr. Greenhagen said if there was flexibility about the decision, it could be valuable. There have been changes already with the latest RFI asking for technical implementation using hardware to achieve VIPER science objectives. You could ask the community for the most important science objectives to review proposals that way, or through an RFI or Special Action Team (SAT).

Mr. Murrow asked about the track record of CLPS; one mission that landed but tipped over, another that spent all its money and is still far from launch, and another that failed significantly before it got to the moon. Does the LEAG believe that CLPS is successful and does it endorse going forward the way its structured, or should NASA consider changes to program implementation? Dr. Greenhagen said CLPS has been a success in expanding commercial company's capabilities. Both in adding new companies and in providing opportunities to attempt landing. Nobody expected 100% success. The bigger problem is that you have a large pool of companies that want to fly and a smaller pool that have cost orders and a cadence, and CLPS has fallen behind on getting landers to attempt their landings, which is starting to impact more science missions. VIPER was going after some of the biggest questions in the Decadal. It's high profile in terms of the science. There will still be companies on their first or second attempt as the criticality of the payload increases. Mr. Murrow said he's concerned it's getting worse, not better, and NASA is spending money with no results. Dr. Greenhagen said the community is asking for a more balanced approach, and to ensure commercial doesn't replace other options. CLPS is ultimately gong to result in massive opportunities but we're still in the growing pains.

Dr. Ishii asked the MAPSIT team about integrating the data produced by Artemis into the data infrastructure system. Dr. Stopar said planning for that opportunity is through the LEAG cross-AG SAT that's currently ongoing, with one subpanel focused on integrating the data with our existing data and planning for the infrastructure. Dr. Stopar is on that panel. Dr. Ishii said she

was glad it's on the radar screen. Dr. Stopar added that the subpanels have draft reports already and a third report planned as a follow-on.

Dr. Prockter asked about where Planetary Data Ecosystem (PDE) ends and how MAPSIT fits in on tools and software, which is part of PDE. Dr. Stopar said MAPSIT is one element of PDE on their website, which is a great synergy. They were happy to see NASA made an ecosystem and ensure AG activities are in line with the needs of the PDE. Often there will be a dataset not functioning well with another dataset and the community scrambles to make them work together, having to make specialized tools to do their mission planning. There's a lot of stovepipes and groups doing their own thing and not an avenue for open communication. Dr. Fergason added, PDE agrees on the stovepipe nature of data and software and tools versus planetary body missions, and it's in the PDE IRB report. The communities are recognizing that it would be better to have better standards and interoperability.

Mr. Barbee said the RFI on using Janus for Apophis is encouraging. Some key science can only be done if you can see the details of the asteroid surface before and after the approach. It sounds like Ramses is the only mission that would get to the asteroid before the earth encounter, and it has to get through the ministerials, with very little runway. He asked if there has been thinking about a backup plan. Dr. DiBraccio said most of the discussion for analysis pre-close encounter has been NASA support to Ramses, mostly because of budgetary constraints. There's no cost to the government on Janus. There isn't discussion of a backup. Dr. Barbee said, as the asteroid was discovered in 2004, there could be public perception issues with saying the timeline was too short. Dr. DiBraccio agreed there will be a lot of public interest in this close encounter because it will be visible to the naked eye. The Planetary Defense Coordination office is working hard to ensure coordination with observations either in space or the ground. In terms of prioritization, NASA is following the activities of the Decadal and a lot of the investments in Planetary Defense went to NEO Surveyor. Mr. Barbee expressed support for NEO Surveyor and asked if the main limitation is budgetary. Thinking of the sandpile charts shown for the budget, the Decadal made recommendations about that budget and supported a competed mission line after NEO Surveyor. Dr. DiBraccio said the Planetary Defense line grows with NEO Surveyor and then shrinks back to the pre-NEO Surveyor mission. Mr. Barbee expressed the importance of funding the pathway so the Decadal recommendations can be carried out, and Dr. DiBraccio said absolutely they want to follow those recommendations with new missions. New Frontiers 5 and Discovery are not currently planned within the next two years, much less newer mission lines. Mr. Murrow agreed that Discovery and New Frontiers have been stalwarts of planetary science. He said Dragonfly is taking up a lot of the budget, New Frontiers is delayed, and characterized SIMPLEx (Small Innovative Missions for Planetary Exploration) as not very successful, registering concern for the budget and being overcommitted. Dr. Webb agreed with the budget comment, saying that he is highly sensitive to this. In the Earth Science Decadal Survey there's guidance from NAC on priorities and striking the right balance between competed and directed missions. He said he's very aware of how Dragonfly has overrun. Dr. Ishii said the PAC can't get a handle on this very big problem in just a two day meeting, but wants to do it in Spring.

Mr. Barbee said once the asteroid Apophis is gone it's gone, and it's a one in 7,500 year event, even if the timing doesn't align with the budget.

Dr. Ishii asked about the Mars finding on aging orbital assets. Mr. Murrow asked about the ESCAPADE mission (Escape and Plasma Acceleration and Dynamics Explorers) not appearing in the fleet chart. Dr. Niebur reminded the PAC that as Acting Deputy Director, he will not be in charge of Mars. Dr. DiBraccio explained that although ESCAPADE is a Mars mission, it's in the Heliophysics Division and appears on their fleet chart. She offered to bring in someone from Heliophysics Department to discuss its progress.

Dr. Ishii asked about PAC elevating the OPAG finding on Uranus Orbiter and Probe start and on super heavy lift vehicles. She also noted time sensitive findings coming out of MExAG to get participation in BepiColombo calls and Mercury Lander.

Dr. Greenhagen said the PAC had a finding about slipping lunar opportunities. About half an hour ago the PRISM 4 (Payloads and Research Investigations on the Surface of the Moon) opportunity slipped from ROSES-2024 to ROSES-2025 different than what had been expected. It was positive that NASA told the community now, rather than waiting until February. These things have moved around a lot. He wondered if there was a way to have updates more regularly with "no earlier than" dates.

Dr. DiBraccio noted that trying new things and new opportunities is causing some of these delays. She asked if NASA can anticipate the New Frontiers CAPS report soon. Dr. Paty said OPEG is excited for the community announcement of New Frontiers 5, which she thought was different than the call. Dr. Niebur said they won't have anything to say until they hear from CAPS on their report, and digest and discuss it internally, so it's weeks to months away from sharing any kind of update. His goal is not to repeat the experience from a few years ago of releasing community announcements every month and it being overwhelming. He wants to get the draft AO out as soon as possible in 2025 to get ready for the 2026. Dr. Paty asked if the CAPS report will be public. Dr. Niebur said there aren't historically community announcements, prior to a few years ago when things were changing so quickly. He didn't anticipate as much changing from the last draft to this one. The CAPS report, once delivered, is public. But November/December is a difficult time to pull together meetings and he was not certain how long it will be.

Mr. Murrow returned to the question of the super heavy launch vehicle. He asked OPAG to provide more context on the potential future and what they hope to get out of it. Dr. Paty said for example on Uranus Orbiter and Probe, heavy launch vehicles gives NASA more flexibility with launch windows because they get to the destination faster.

Mr. Murrow asked about the cooperation on Moon to Mars, particularly bringing the program office to headquarters. Is HQ going to become a true program office or delegate to the centers? Perhaps the $11B in 2040 was a mark in the sand to get people to react.

Dr. Hays said they're staffing a whole systems engineering office and risk management, so it's creating a full program office at HQ with all the roles represented. Their own offices are staffing up and some will likely come from different centers.

Dr. Ishii asked why the Analog Sample Library are superior and require the allocation panels. Are other samples collected at the site equally well handled by those interested. Dr. Hays said the samples are as homogenous and uniform as possible, so if a researcher requests one particular sample, they know it's equivalent to the samples other groups did a different analysis on. Additionally, these samples will come with a collection history and field notes as well as analysis from the Norwegian Geotechnical Institute. Anyone can also collect their own samples and NASA isn't trying to gatekeep, just make this opportunity available to the community.

DAAR Update

After a brief break, Dr. New addressed previous PAC findings and recommendations on inclusion. He provided an update on Inclusion Planning, saying it was not decided that they would be required of all R&A proposals. They're not required by any program, although some AOs do have them required. SMD has held two virtual workshops on this topic, and has created a dedicated website. SMD doesn't generally provide rubrics to panels, but has one made public at the IDEA Planetary Science Conference, and LPSC will have a workshop.

Dr. New responded to the PAC's concern on the NSSC, saying the office has been aware of the problems and are trying to get to the bottom of them, and communicating about these. Some of the difficulties come from larger changes outside NASA's control, such as the Office of Management and Budget (OMB)'s new Uniform Guidance (2-CFR-200) effective October 1. This comes from the Executive Office. There are new policies and processes on research integrity coming out of the National Security Presidential Memorandum - 33. These new risk analyses are causing some delays. There was also an audit of the NSSC that changed the ways procurement operates, such as the sudden and unexpected change in the policy of enforcement for extension. That came from an audit finding. Transfers involve three bureaucracies so the difficulties are cubed. SMD will continue to engage with NSSC and the Office of Procurement to improve things.

Our response to an Academy of Sciences study on DEIA is to implement new standards for inclusion. SMD has published research on the diversity of Astrophysics Explorers proposals and the MOSAICS (Mentorship and Opportunities in STEM with Academic Institutions for Community Success). Research Initiation Awards Programs explicitly target non-R1 institutions. Dr. New shared some statistics, such as that a quarter of relevant PhDs are given to women, yet there were 18 missions with no women on the whole science team. Realistically, astrophysics is not worse than most other divisions there. Planetary science has a history of female PIs proposing to New Frontiers. Dr. New described the NASA Yearbook which makes aggregated demographic data available to the community. They are releasing the ROSES 22 Yearbook soon. NASA can't update the NSPIRES Personal Profile questions because they're maintained by

OMB. One suggestion has been to create a NAC subcommittee on IDEA. NASA doesn't have this ability, but it was presented to the NAC Science Committee and the committee was created.

Q&A
Dr. Ishii asked how aggressive the plan is to disseminate inclusion plan resources to the community. Is the website in the ROSES calls? Dr. New said it should be. ROSES-2025 is coming out in February so the resources will be pointed to on the SARA website. Dr. Jessup suggested it be included in the AO table, and that it be clear if it's not evaluative. Dr. New said there are also program libraries specific to an AO and the documents are in there. He was unaware of upcoming planned workshops, as the focus has been on finishing the rubric.

Dr. Kiefer said he understands that some of the new paperwork is not coming from NASA, but was wondering about the Current and Pending Support template in ROSES that asked for dollar values for all grants. Previously in ROSES it was explicit not to bother with this. Dr. New said NASA is required to collect whatever data they're instructed to, so if they've been told they need the dollar values, that's the situation. He said there's a question of whether it has to be collected at the time of proposal or only at award, which is being worked out with Grants Policy and Compliance. They also need full CVs, not short CVs, which comes out of the White House. Dr. Kiefer asked if that is just for Co-Investigators on missions, or every subcontract on a small grant. Dr. New said a Co-Investigator should have their own award, a subaward from the Primary Investigator's institution, so that's the pending award. He added that he and Dr. Nahm also have an intern coming in the Spring to collect reviews submitted for Inclusion Plans and evaluate the commentary, which will probably lead to another Inclusion Planning workshop.

<u>Astrobiology Update</u>
Dr. McCauley Rench introduced Dr. David Grinspoon as Senior Scientist for Astrobiology Strategy; her own role is permanent as Program Scientist for Astrobiology. She shared other staffing changes in the department and provided updates on the Astrobiology Research Coordination Network (RCN). They have hired a Support Liaison to reduce administrative burden on the co-leads, providing newsletters, email lists, web updates and events and activities.

She reviewed the Astrobiology Research Programs. The scope of PSTAR is also going to be changing in ROSES 2025 to allow non astrobiology analog research. The Habitable Worlds program is being merged into Exobiology and the Exoplanets Research Program. Step-2 proposals for Interdisciplinary Consortia for Astrobiology Research, which is solicited through ROSES-2024, are due Jan 16, 2024.

Dr. McCauley Rench shared recent research highlights including measuring atmospheric composition on hydrogen rich atmospheres and looking at the impact of oxygen levels in earths' early oceans. She said the selection rates on astrobiology research programs are in the 20-30% range. She also shared Our Alien Earth, a new documentary on NASA+ that features recent research. Finally, she discussed progress of the Astrobiology Mission Ideation Factory. Last year

they finished Phase 1 at NASA Goddard, and will conduct Phase 2 this week with mock data at Ames Research Center. They are looking for new topic ideas.

Dr. Grinspoon discussed strategies to increase cross divisional/cross directorate activity. There will be a session at AGU devoted to Ocean Drilling and a series of meetings and workshops on interdisciplinary topics. He shared upcoming activities such as the new Astrobiology Federation, with representation across SMD and other areas of NASA involved in astrobiology, meeting bimonthly. Astrobiology focuses on three fundamental questions: 1. How does life begin and evolve? 2. Does life exist elsewhere in the universe? And 3. Does life exist elsewhere in the universe? A Future of Life meeting is planned for October 16-18, 2024. A report for the meeting is expected by the end of the year focused on interdisciplinary collaboration.

Dr. Grinspoon profiled the NASA-DARES (Decadal Astrobiology Research and Exploration Strategy), which builds off the priorities and recommendations of the OWL report. However, DARES will be more detailed and granular within astrobiology. Astrobiology started in PSD but is now cross-divisional. There is an RFI as a tool to gather input but it will not be the final document. There will be 2 task forces, a workshop and a town hall meeting.

RCN: LIFE

Dr. Frank Rosenzweig reported out from Research Coordination Network, a "network of networks." He reviewed the history of the RCN, which started at the NASA astrobiology institute – democratizing themes like exoplanet science. RCNs don't solicit or give away money. Life: From Early Cells to the Advent of Multicelluarity is the newest RCN.

He said the goals are to build a community dedicated to understanding life-planet co-evolution and to develop a science of living worlds. He shared the staffing and steering committee. They have a monthly seminar series and conduct outreach to research programs, through virtual workshops and research. He shared which selections have chosen the Life RCN, and shared research through the Exobiology program.

Additional Q&A/Discussion

Dr. Cable asked if, given the expanded scope for PSAR beyond astrobiology, Dr. McCauly Rench will still be doing the PAC report out from Astrobiology. Dr. McCauly Rench said it will continue to come from their team, but some non-astro reporting may be broken out and delivered by Dr. Vander Kaaden.

Dr. Ishii asked if it is possible to track the funding across ExoBio/Habitable worlds/XRP and if the PAC can see that in future meetings. Dr. McCauly Rench said yes and since the budgets will be a little different, she'll connect with Dr. Vander Kaaden in advance to make adjustments as needed. ROSES-2025 will be more difficult because the 2024 awards will just be coming in, and there may be overlap, so it will take longer to see how it's working.

Dr. Ishii reminded the group that she, Dr. Kiefer, Dr. Danielson and Dr. Meyer-Dombard, Dr. Robinson and Dr. Cable will be leaving the PAC. She expressed thanks to all the PAC members

who have put in so much work. Dr. Cable added she's not contributing to any OPAG discussion of findings as her term comes to a close.

The committee discussed draft findings and recommendations. They hope to have a draft fleshed out by the end of next week and a finalized report for PSD in Mid December. Dr. Ishii reviewed the content she definitely wanted to include:

- Congratulations to Europa Clipper and thanks to Lunar Reference Frame Working group.
- Finding restating and expanding prior finding about the definition and acknowledgement of operational linkages to Moon 2 Mars and robotic precursors to MMS
- Appreciation for all the thought and effort that's gone into creating rubric and internal policy documents on ROSES requirements, including using expert practitioners to evaluate them.
- Recommendation pushing for broad dissemination of inclusion plan resources including links in ROSES and the AO documentation, among other places. It's starting to happen but it may be helpful for PAC to encourage it and suggest efficiencies. She asked for objections to this list so far, and there were none.
- On the VIPER cancellation, the committee discussed the wording of the proposed NAC finding, given that the NASA RFI evaluations are complete. The wording from the NAC recommended "keeping the rover intact and taking no irreversible action." They also discussed a recommendation requesting NASA to publicly release the appropriately redacted information provided in the response to the open letter from Congress regarding the VIPER termination, in the interest of more transparency of the decision-making process.

Dr. Prockter noted that the second recommendation is easy and actionable, but she was less sure about the first one. NASA is mid-process and it might be premature, plus the science community has already weighed in on the cost-benefits through open letters and the LEAG. She had the same comment on findings for LPSC, as she was unsure it was up to the PAC to fix concerns about the process and the lack of transparency on that. Dr. Curry agreed, as the PAC didn't have the budget in front of them. The comment might focus on the rollout.

Dr. Prockter expressed the difficulty of making a recommendation on Astrobotics that doesn't talk around the rest of the CLPS program. Mr. Murrow said he sees more cost risk from all the other CLPS landings from untested missions. He felt NASA needs to rethink the risk posture of CLPs given all the mainline interests at risk because of the potential cost overruns in CLPS. Dr. Curry said rather than a finding on what NASA should do, she preferred raising the discrepancy in the business model of CLPS and asking if NASA should reassess the program model. Mr. Murrow agreed, as did Mr. Barbee. He said it was emblematic of the larger budget problem and interconnected with Artemis, the Mars initiatives, and everything else PSD is trying to do. There needs to be accounting for everything and an appropriate budget request. The cis-lunar economy is somewhat aspirational; NASA is the customer for building lunar landings. Dr. Prockter

reiterated that she doesn't want to overstep the role of the PAC. Some of the complaints stem from the Fiscal Responsibility Act. Every program in MSR has overruns and delays, it's not unique to CLPS, which is the one program where NASA isn't trying to be risk averse. She wanted to understand what's likely to happen given the election, as well as why the community didn't hear about VIPER until it was built; why weren't the challenges seen sooner and addressed. Dr. Ishii suggested maybe the PAC could issue a finding, rather than a recommendation, since CLPS is under SMD rather than PSD. Dr. Kiefer said he would advocate for a simpler finding because by the next PAC meeting, there will be more data points, and the PAC could request a briefing at an appropriate time next year. If CLPS is zero out of three in the present, and by next year it's zero out of five, the PAC needs to rediscuss this. Dr. Woods agreed, suggesting the PAC could ask about NASA's planned posture for risk and if this an acceptable learning opportunity. Mr. Murrow said he appreciated the more measured response of other committee members. He heard someone say MSR had problems and went through a rethink. Discovery and New Frontiers had problems and a rethink. CLPS is full speed ahead. He suggested the PAC recommend that NASA revisit/rethink the risk posture of CLPS future landings given the budget situation of PSD. Dr. Prockter asked if he meant like a senior review of CLPS. Mr. Barbee said although it's desirable to be risk tolerant, if you don't have the resources to absorb stumbles and failures, it's setting up the wrong kind of risk. Dr. Ishii reminded the committee that PSD can't reply to a recommendation that's aimed above the Division.

Dr. Danielson recommended that the PAC say something different than what's in the OAG report, which is 40 pages and had recommendations, and was provided to NASA with a set of planned actions in response. The VIPER cancellation was later. Mr. Murrow agreed with that.

Dr. Grant had to leave at 5:36.

Mr. Murrow asked Dr. Gramling if the Chinese Martian samples return before NASA's, will the international sharing discussed by Dr. Hays still play out the same way. Mr. Barbee said he didn't think it made sense to advocate for strategy that concedes the point yet, given the amount of change in the air. Dr. Gramling said Dr. Hays could speak better to that plan and timeline. The Administrator requested an advance on the NASA sample return date. Mr. Barbee advocated for a finding about the need to be strategic, framed proactively. Mr. Murrow felt it was a discussion question, not a finding.

Dr. Kiefer recused himself during discussion on the Planetary Science finding to incorporate community input on the LPSC. Dr. Danielson said she didn't fully understand the request, given that there's an RFI right now. Dr. Ishii said it was about having an assessment criterion to ask for community input on how the meeting is organized, and the willingness to incorporate it. Not a requirement, as NASA can't put too many requirements on the provider since it's not a NASA-led meeting. In addition, she raised the fate of the LPSC meeting abstract archive.

The PAC discussed a potential finding asking PSD about submitting an RFI and calls for mission participation in internship programs. This would be a couple years out in terms of readiness. Dr. Prockter asked where the budget for that would come from. She asked where ICONS gets their funding. Dr. Niebur said it came from Europa Clipper project funds transferred to the Outer Planets research bin. He said it was being done on Clipper because it was made a priority and the project sacrificed other areas. The question is, why is that the only effort making this kind of thing a priority. Mr. Barbee raised potential alternate sources of funding for internships, such as the Maryland Space Grant Consortium. Dr. Ishii noted that Dragonfly also has an excellent internship program.

Dr. Ishii ran through the remaining concept or draft findings, including:

- The importance of Participating Scientist Programs – a potential recommendation to consider the benefit of open calls over renewals even in budget constrained situations.
- Securing US participation in future BepiColumbo calls (elevating the NExAg finding).
- Encouraging NASA to initiate a directed study for a candidate Mercury lander flagship mission, which is a Decadal recommendation (elevating the MExAg finding).

Dr. Prockter said it would be worth asking about studies recommended in the Decadal, midterm, including the Mercury study, since NASA is getting ready for the next Decadal survey. Or asking what they're doing to get ready for the Midtern. Mr. Barbee and Dr. Prockter volunteered to work on the language for these findings. On a potential finding in favor of the Uranus Orbital Probe start in FY 27 consistent with the Decadal, Dr. Prockter wasn't sure if she was conflicted. Dr. Niebur said a finding to do what's in the President's Budget isn't critical since NASA will do it if Congress provides the funds. Dr. Kiefer offered to work on the language of a finding around aging orbital assets at Mars, using prior PAC examples. Mr. Murrow approved. On Super Heavy Lift Launch Vehicles, Dr. Kiefer suggested it be rolled into the Orbital Probe finding. Dr. Cable said she was conflicted out of that discussion. On the topic of available launch vehicles, Dr. Ishii said the influence must be limited to what was discussed in this meeting. Mr. Barbee didn't think there was enough discussion on that, and Dr. Kiefer agreed.

They discussed a past SBAG finding on the planned post-Surveyor Planetary Defense budget or increasing the planned post-NEO Surveyor budget, to support a competed mission line. Mr. Barbee felt this was in contrast to the sand pile chart shared earlier in the meeting. Dr. Kiefer suggested carrying the discussion over to the Spring meeting since there was not consensus. Dr. Ishii agreed. On the asteroid Apophis, Dr. Ishii said she did not hear a way forward. Mr. Barbee said he'd like to hear more about this in the spring, including progress on Ramses.

Since the meeting was at time, Dr. Ishii thanked all attendees, participants and presenters, the members rolling off, Dr. Robinson and the support staff.

Adjourn

The meeting was adjourned at 6:09 PM ET.

Appendix A

Attendees

Planetary Advisory Committee Members

Hope Ishii
Shannon Curry
Walter Kiefer
Lisa Danielson
D'Arcy Meyer-Dombard
Tyler Robinson
Brent Barbee
Kandi Jessup
John Grant
Louise Prockter
David Murrow
Morgan Cable
Deborah Woods

Other Participants:

Zaid Al-Attabi
Cerese Albers
Abhishek Anand
Adel Aqq
Brent Archinal
Kanisha Armintia
Jim Armor
Chantelle Baier
Steve Baloga
Don Barker
Michael Beavin
Eve Berger
Marufa Bhuiyan
Linda Billings
Mike Bland
Kristin Block
Maitrayee Bose
Bill Bottke
Ardith Bravenec
Joao Brosa
John Brown
Debra Buczkowski
Aaron Burton
Paul Byrne
Jason Callahan
Robin Canup
Mark Carreau
Julie Castillo
Ruilin Cheng
Neeraja Chinchalkar
Matt Chojnacki
Hamed Chok
Stephen Clark
Rachel Claude
Barbara Cohen
Mike Combi
John Cooper
Jemma Davidson
Richard Davis
Rebekah Dawson-Rigas
Ramon de Paula
Dr Deepak Kumar
Brett Denevi
Elaine Denning
Ramon Depaula
Lamont Di Biasi
Gina DiBraccio
Tammy Dickinson
Serina Diniega
Cynthia Dinwiddie
Paula do Vale Pereira
Estelle Dodson
Diana Dragomir
Mark Elowitz
Kim Ennico
Kimberly Ennico-Smith
Robin Fergason
Annina Fernandez
Justin Filiberto
James Florance
Bobby Fogel
Jeff Foust
Veronika Fuhrmann
J.L. Galache
Jordan Garberding
Tom Gardner
Carlos Gary-Bicas
Aleks Gawronska
Karen Gelmis
Diana Gentry
Chris German
Leslie Gertsch
Stephanie Getty
Jeff Gillis-Davis
Leo Gomez
Leopoldo Gomez
Jeff Gramling
Ben Greenhagen
David Grinspoon
Jeff Grossman
Roberto Guenzani
Vicky Hamilton
Romy Hanna
Dae'Vion Harris
Rachel Harris
Melody Hartke
Brian Harvey
Heidi Haviland
Alex Hayes
Lindsay Hays
Philipp Heck
Amanda Hendrix
Deb Hernandez

Barbara Hilton
Jeffery Hollingsworth
Zhengwei Hu
Eric Ianson
Wael Ibrahim
Doug Isbell
Noam Izenberg
Hannah Jang-Condell
Heidi Jensen
Teresa Jensen
Alana Johnson
Karl Johnson
Lauren Jozwiak
Hilary Justh
Wendy Kartje
Jennifer Kearns
Joel Kearns
Michael Kelley
Mike Kelley
Clemencia Kelly
Tony Kim
Mallory J. Kinczyk
Kas Knicely
William Knopf
Tommi Koskinen
Linda Krause
Alex Krstic
Nick Lang
Allen Larar
Diksha lavaniya
Christy Layton
Greg Lee
Michael Lienhard
Jack Lissauer
Jen Lu
Jeannette Luna
Prasun Mahanti
Tariq Malik
Joe Masiero
Abraham Mateos Gallego
Majd Mayyasi
Becky McCauley Rench
Gene Mikulka
Kelly Miller
Laura Mills
Michelle Minitti
Henal Modha
Erica Montbach
LaJuan Moore
Thomas Morgan
Tiffany Morgan
Melissa Morris
Jon Morse
Scott Murchie
Amanda Nahm
Vinitra Nathan
Michael New
J.Michael Newman
Fiona Nichols-Fleming
Curt Niebur
Conor Nixon
Sarah Noble
John Noonan
Monserrat Ochoa Altamirano
Ryan Ogliore
Alison Olcott
Omotolase Osisanlu
Kaveh Pahlevan
Lane Painter
Rutu Parekh
Stephen Parman
Saumya Pathirana
Carol Paty
Marshal Pennock
Cynthia Phillips
Anya Portyankina
Jani Radebaugh
Julie Rathbun
Julie Rathbun
Laura Ratliff
Ujjwal Raut
Kurt Retherford
Andrea Riley
Stephen Rinehart
Ed Rivera-Valentín
Corneilius Robinson
Katie Robinson
Frank Rosenzweig
A Rowe
John Rummel
Abi Rymer
Paul Sánchez
Elizabeth Sandvik
Delia Santiago-Materese
Kunio Sayanagi
Rebecca Schindhelm
Mitchell Schulte
Phil Scott
Jennifer Scully
Laura Seifert
Glenn Sellar
Patricia Semmler
Jamie Shumbera
Margaret Simon
Irek Slesak
David J. Smith
Heather D. Smith
Sue Smrekar
Krista Soderlund
Amanda Stadermann
Sara Stanley
Tom Statler
Garrett Stevenson
Vitalii Stoliarchuk
Julie Stopar
Sarah Sutton
Patrick Taylor
Alexandria Terry
Keyana Thomas
Meagan Thompson
Henry Throop
Raymond Tolomeo
Tara Tomlinson
Omar Torres
Melissa Trainer
David Traore
Bo Trieu
Julie Tygielski

Sarah Valencia
Kathleen Vander Kaaden
G Varsi
Jenni Veach
Anne Verbiscer
Paul Voosen
Molly Wasser
Sam Waters
Ryan Watkins
Charles Webb
Shoshana Weider
William West
John Whitehead
Cal Whyte
Jaclyn Wiley
Curtis Williams
Marcella Yant
Jumanazarov Zohidjon

Appendix B

Advisory Committee Membership

Dr. Hope Ishii, Chair
University of Hawaii at Manoa

Dr. Shannon Curry, Deputy Chair
University of California, Berkeley

Dr. Katharine Robinson
NASA Executive Secretary

Dr. Walter Kiefer
Lunar and Planetary Institute

Dr. Lisa Danielson
Los Alamos National Laboratory

Dr. D'Arcy Meyer-Dombard
University of Illinois at Chicago

Dr. Tyler Robinson
Northern Arizona University

Mr. Brent Barbee
NASA Goddard Space Flight Center

Dr. Kandi Jessup
Southwest Research Institute

Dr. John Grant
Smithsonian

Dr. Louise Prockter
Johns Hopkins University Applied Physics Laboratory

Mr. David Murrow
Retired (Lockheed)

Dr. Morgan Cable
Jet Propulsion Laboratory

Dr. Deborah Woods
Massachusetts Institute of Technology Lincoln Labs

Appendix C

Presentations

1. Nasa Science - Planetary Science Advisory Committee, *G. DiBraccio*
2. NASA PSD Community Support Changes, *T. Morgan*
3. Europa ICONS: A New NASA Undergraduate Planetary Science Internship to Create a More Diverse Europa Science Community, *A Nahm, C. Niebur*
4. NASA Lunar Reference Frame Assessment: Findings and Recommendations, *R. Fergason*
5. Planetary Science Division R&A Update, *K. Vander Kaaden*
6. Lunar Science Strategy and Artemis Science Update, *S. Noble*
7. Lunar Discovery and Exploration Program Status, *J. Kearns*
8. Flight Missions - Planetary Science Advisory Committee (PAC), *S. Fitzpatrick*
9. Mars Exploration Program Update, *E. Ianson and L. Hays*
10. Planetary Science Advisory Committee (PAC) Mars Sample Return, *J. Gramling*
11. LEAG Updates and Action Requests, *B. Greenhagen*
12. MAPSIT Community Update and Findings for the PAC, *J. Stopar*
13. VEXAG, *D. Buczkowski*
14. MExAG, *S. Parman*
15. SBAG: Summary of Recent Activities, *J. Masiero*
16. ExoPAG Report to PAC, *D. Dragomir*
17. MEPAG Update, *V. Hamilton*
18. ExMAG, *P. Heck*
19. OPAG, *C. Paty*
20. OWWG Update, *M. Bland*
21. Cross-AG EDIA Working group, *J. Rathbun*
22. DAAR Update, *M. New*
23. NASA Astrobiology Program Update, *D. Grinspoon and R. McCauley Rench*
24. Research Coordination Network, *F. Rosenzweig*

Appendix D

Agenda

NASA Planetary Science Advisory Committee (PAC) Meeting
November 12-13, 2024
WebEx Agenda

Day 1: Tuesday, November 12 , 2024

Public WebEx Connection Information:
https://nasaenterprise.webex.com/nasaenterprise/j.php?MTID=m271e70e86554d180b08f37a9b522d5f2

Webinar number: 2823 502 1639

Password: PAC-day1 (72203291 when dialing from a phone or video system)

Join by phone: +1-415-527-5035 United States Toll (Access code: 2823 502 1639)

Item & Speaker	Length (minutes)	Time (Eastern)
Welcome/Around the table Katie Robinson and Hope Ishii	15	10:00-10:15
Update from the NAC Hope Ishii	15	10:15-10:30
PSD Update Gina DiBraccio	45	10.30-11:15
Additional Q&A/Discussion	15	11:15-11:30
NASA Community Support Tiffany Morgan	30	11:30-12:00
Additional Q&A/Discussion	15	12:00-12:15
Lunch	45	12:15-13:00
Europa ICONS Amanda Nahm	15	13:00-13:15
Lunar Reference Frame Robin Fergason	15	13:15-13:30
Additional Q&A/Discussion	15	13:30-13:45
R&A Update Kathleen Vander Kaaden	60	13:45-14:45
Additional Q&A/Discussion	30	14:45-15:15
Public Comment Period	15	15:15-15:30
Break	30	15:30-16:00
Lunar Updates Sarah Noble	30	16:00-16:30
ESSIO Updates Joel Kearns	45	16:30-17:15
Additional PAC Discussion	45	17:15-18:00

*Comments and questions from the public may be provided, via WebEx, during the Open Comment Period (15 minutes). PAC members will consider these comments starting at 15.15.

Day 2: Wednesday, November 13, 2024

Public WebEx Connection Information:
https://nasaenterprise.webex.com/nasaenterprise/j.php?MTID=m01b087a56d284d8b74bb489b28dc6c38

Webinar number: 2823 033 9565

Password: PAC-day2 (72203292 when dialing from a phone or video system)

Join by phone: +1-415-527-5035 United States Toll (Access code: 2823 033 9565)

Item & Speaker	Length (minutes)	Time (Eastern)
PSD Flight Missions Update Shannon Fitzpatrick	45	10:00-10:45
Additional Q&A/Discussion	15	10:45-11:00
Mars Exploration Program Updates Eric Ianson & Lindsay Hays	30	11:00-11:30
Mars Sample Return Updates Jeff Gramling	30	11:30-12:00
Additional Q&A/Discussion	20	12:00-12:20
Public Comment Period	10	12:20-12:30
Lunch	45	12:30-13:15
Assessment/Analysis Group (AG) Updates LEAG MAPSIT VEXAG MExAG SBAG ExoPAG MEPAG ExMAG OPAG OWWG XAG IDEA XAG	90 10 10 2 2 2 2 2 2 2 2 2	13:15-14:45
Additional Q&A/Discussion	30	14:45-15:15
Break	30	15:15-15:45
DAAR Update Michael New	30	15:45-16:15
Astrobiology Update Becky McCauley Rench & David Grinspoon	30	16:15-16:45
RCN: LIFE	15	16:45-17:00
Additional Q&A/Discussion	60	17:00-18:00

*Comments and questions from the public may be provided, via WebEx, during the Open Comment Period (15 minutes). PAC members will consider these comments starting at 12.20.