

Planetary Science Advisory Committee, February 15, 2022

**NASA Advisory Council
Planetary Science Advisory Committee**

February 15, 2022


Virtual Meeting

**NASA Headquarters
Washington, D.C.**

Amy Mainzer

Amy Mainzer, Chair

Stephen Rinehart
(NASA HQ PSD)

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Stephen Rinehart, Executive Secretary

Table of Contents

| | |
|----------------------------------|----|
| 1. Welcome and Introduction | 3 |
| 2. PSD Update | 3 |
| 3. PSD R&A Update | 7 |
| 4. PAC “101” | 9 |
| 5. Public comment | 11 |
| 6. MExAG | 12 |
| 7. SBAG | 12 |
| 8. VEXAG | 12 |
| 9. MAPSIT | 12 |
| 10. ExMAG | 13 |
| 11. OPAG | 14 |
| 12. LEAG | 14 |
| 13. ExoPAG | 14 |
| 14. General Discussion | 15 |
| 15. Findings and Recommendations | 15 |

Appendix A- Attendees

Appendix B- Agenda

Appendix C- Membership

Appendix D- Presentations

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February 15, 2022

Welcome and Introduction

Dr. Stephen Rinehart, Executive Secretary of the Planetary Science Advisory Committee (PAC), opened the meeting and made administrative announcements.

Planetary Science Division Update

Dr. Lori Glaze shared an update on the Planetary Science Division (PSD), and announced the addition of new PSD members: Tiffany Morgan has come on board as Mars Exploration Program Deputy Director, and Program Scientists Doris Daou, Delia Santiago-Materese, and Kathleen Vander Kaaden are now permanent staff at Headquarters. IPA Nicole Zellner has also joined PSD as a Program Scientist. Other additions are Stacey Cunningham, Erin Morton, and Tahira Allen, who is a Digital Communications Specialist focused on Astrobiology and the rest of PSD. The current planetary fleet is comprised of 39 missions, including 6 Commercial Lunar Payload Services (CLPS). The Volatiles Investigating Polar Exploration Rover (VIPER) will also be a CLPS delivery. The Luna-H cubesat has been delivered and will be launched on Artemis I. The Double Asteroid Redirection Test (DART) successfully launched in late 2021, and is on its way to impact the asteroid system Didymos/Dimorphos on 26 September 2022. The effects of the kinetic impact will be observed by a number of ground-based (GB) assets, and also by the mission's co-manifested Light Italian Cubesat for Imaging of Asteroids (LICIACube). Briefly updating on the status Lucy asteroid probe, which launched in late 2021, Dr. Glaze described an issue with one of the spacecraft's solar arrays. The second array did not quite complete its deployment; the team has determined that the array did not latch, and is now discussing whether to redeploy it or use it as is. The arrays have produced plenty of power thus far, and the mission team hopes to make a final decision later this Spring. The Psyche mission is still due to launch in August of this year despite COVID and technical challenges; environmental testing is now under way. A Pre-ship Review is scheduled for mid-April, and delivery in mid-May. The Janus small satellite mission will launch with Psyche. OSIRIS-REx is due to return to Earth with its samples in September 2023; Step-1 proposals for the ROSES-21 OSIRIS-REx Sample Analysis Participating Scientist Program (Dual Anonymous Peer Review) are due 28 February. The Johnson Space Center received its first set of Hayabusa-2 samples in December. Proposals to study JAXA-catalogued Hayabusa-2 samples can be submitted to LARS from 13 February 2022. It is expected that JAXA sample availability will be announced this Winter, for allocation in early Summer 2022. The catalog of U.S. sample share (10%/0.5 g) will be posted by late Spring 2022 and opened to loan requests.

The Europa Clipper continues to make good progress; the mission is finishing flight hardware, completed its Key Decision Point-D (KDP-D) this month, and is on track for starting ATLO in March 2022. Areas of concern include delivery of instruments in time for Assembly, Testing, Launch and Operations (ATLO); avionics (COVID); solar array (COVID and global supply chain disruptions). NASA is keeping close eye on these complex components. The Dragonfly mission to Titan, set to launch in 2027 and arrive at Titan in 2034, has tested a model of the rotor craft in the desert, and is scheduled for a Preliminary Design Review (PDR) later this year, followed by the move to implementation. The Applied Physics Laboratory (APL) now has a Titan test chamber, and has begun testing the PICA-D heat shield material.

The Mars Exploration Program (MEP) continues to move forward. The Perseverance rover has now collected 8 samples, including one witness tube, 1 atmosphere tube, and 6 rock cores. The rover experienced a minor issue with a coring tube, which needed to be emptied of debris before it was able to collect the “Malay” sample. The Ingenuity helicopter has been flying ahead of the rover and has made 19 flights to date. An international Mars Ice Mapper Measurement Definition Team has been established, and the first Joint Steering Group between the MEP and the Mars Sample Return (MSR) program has taken place. The InSight seismic probe briefly went into safe mode due to a Mars dust storm. All MEP missions have been accounted for in the 2022 budget, including Ingenuity, and are budgeted through the end of the Fiscal Year. MEP held a kickoff event to begin creating a framework for a Strategic Plan, in preparation for the upcoming Decadal Survey. A Low-Cost Science Mission Concepts for Mars Exploration Workshop has been rescheduled to 29–31 March, 2022 in Pasadena, and a Science Objectives for Human Exploration of Mars Workshop will be held in Denver, from 4–6 May.

The Mars Reconnaissance Orbiter (MRO) has been monitoring a large seasonal dust storm. The Mars Atmosphere and Volatile Evolution (MAVEN) orbiter has been detecting coronal mass ejections (CMEs) as well as high radiation streams that typically precede solar storms. A science “nugget” from Curiosity, recently published, involved the use of the Sample Analysis at Mars (SAM) instrument that detected some interesting carbon signature ratios that were preserved in the rocks; the results were intriguing for the suggestion of life, but there are two other hypotheses that support the nonmicrobial origin of these signatures. Dr. Glaze asked the PAC to encourage the community to send science nuggets to (kathleen.e.vanderkaaden@nasa.gov), and to seek examples at [<https://www.lpi.usra.edu/nuggets>].

The MSR program is working to complete Phase A activities, including technical and programmatic trades and initiation of long-lead items. The Mars Ascent Vehicle Integrated System (MAVIS) has been awarded to Lockheed Martin, and the KDP-B for this component may be accomplished as early as Summer 2022. The Perseverance science team published its first findings in *Science* (October 2021), as part of MSR Campaign science activities; more papers are in process. NASA is also working on a memorandum of understanding (MOU) with the European Space Agency (ESA) on campaign science. A Request for Information (RFI) has been released for potential vendors to establish a Sample Receiving Facility (SRF), with a Request for Proposals (RFP) for trade studies expected this Spring. Exploration Science Strategy and Integration Office (ESSIO) highlights include a well-attended International Observe the Moon Night, boasting 500,000 observers. The first Payloads and Research Investigations on the Surface of the Moon PRISM-1 call is complete, and PRISM-2 proposals are now under review, with selections due later this summer, for flights in beginning in 2025. Upcoming Lunar Surface Science Workshop events include one on the subject of Heliophysics applications [<https://lunarscience.arc.nasa.gov/lssw/events>].

In Planetary Defense, two new NASA-funded Asteroid Terrestrial-impact Last Alert System (ATLAS) telescopes are now operating in Chile and South Africa as part of the Near-Earth Object (NEO) Survey. The current status on the detection of near-Earth asteroids (NEAs) of 140m or greater includes a total of 546 detected in 2020, and 42 detected thus far in 2022. The total count has just passed the 10,000 mark, but the rate of discovery has leveled out, and new

technology will be needed to increase this rate in order to meet the George E. Brown legislative goal. Astrobiology updates include the completion of a Summer workshop for establishing standards of evidence for life detection, which led to the National Academies directing the Committee on Astrobiology and Planetary Sciences (CAPS) to conduct an independent review of the white paper that emerged from the workshop, and to issue a short report. The newest Research Coordination Network (RCN), called Early Cells to Multicellularity (ECM), is now up and running and is developing its charter and website. The Steering Group of ECM will be comprised of NASA-funded Principal Investigators (PIs), soon to be invited.

In community updates, Dr. Glaze announced that there is a new policy/process at the Science Mission Directorate (SMD) for considering NASA contributions to partner-led missions, in order to allow a little more lead time for proposers. She noted that there is currently an M6 (medium class) call for an ESA mission, with letters of intent (LOIs) due this month. Dr. Glaze walked the PAC through a description of the appropriate process:

- Step 1: An idea is brought to SMD's attention
- Step 2: SMD should ensure it has adequate information to consider the idea
- Step 3: SMD should consider the idea
- Step 4: Discuss path forward with the SMD AA
- Step 5: Give a preliminary response to the international partner
- Step 6: Conduct a joint study
- Step 7: Select the U.S. provider for the NASA contribution.

Referencing NASA's much-discussed new Open Science policy, SPD-41, based on recommendations from SMD's Strategy for Data Management and Computing for Groundbreaking Science, Dr. Glaze said that NASA recognizes that the policy represents significant changes, and urged the community to read the document, and to provide feedback by 4 March at [<https://science.nasa.gov/researchers/science-data/science-information-policy>]]. She mentioned as well that a draft on preparatory investigations for Europa is out for public comment, with comments due by 18 March (draft can be found at NSPIRES). NASA will also be advertising for Program Executive job opportunities at Headquarters. The announcement should go live on 17 February and is only open for 5 calendar days. The opportunity can be found at USA Jobs.

The PSD Inclusion Diversity Equity and Accessibility (IDEA) team is actively working in PSD and SMD. The PSD team, led by LaJuan Moore, and Meagan Thompson, is a single group intended to communicate what PSD IDEA initiatives are happening; identify gaps and redundancies in activities; exchange information with various entities in PSD, SMD, and elsewhere at NASA; monitor funding and evaluation of initiatives; and refine PSD's "lanes of influence" and how best to work within them. The Planetary Science and Astrobiology Decadal Survey is on track despite COVID challenges and is expected to be publicly released in mid-April. The new Decadal Survey is expected to be quite a voluminous report. NASA will respond publicly within 90 days, and issue a more formal written response at a later time.

Dr. Glaze addressed a number of November 2021 PAC findings:

Finding 1- Funding for NASA service activities in support of SMD needs. NASA responds that it has created an itemized, delineated table of estimated costs associated with NASA community services, as requested.

Finding 2- Data Analysis Programs Management Strategies. NASA concurs with the finding but has deferred its response due to the imminent release of the Decadal Survey. NASA intends to return to the finding.

Finding 3- SIMPLEx, Discovery and New Frontiers schedules. NASA responds that current schedules are listed while the Agency awaits the release of the budget to determine final schedules, as well as potential guidance from the upcoming Decadal Survey.

Finding 4- NASA Equity, Diversity, Inclusion, Accessibility (EDIA) efforts; PAC requests regular updates on the H2O program. NASA responds that it will provide an update at the next PAC meeting in June.

Finding 5(a)- Science-driven leadership of strategic SMD missions. NASA responds that the iMIM MDT overview and status report were presented on 2 February, pending a final report expected in April, which will be shared with the community.

Finding 5(b)- Lunar Exploration. NASA responds that lunar exploration science resides within ESSIO, where instruments for CLPS and Artemis will continue to be competitively selected based on high-priority science investigations.

Finding 6- Software/Data Management (SPD-41) Open Science. NASA responds by reiterating its previous exhortation to the community to comment on the RFI; the community should be sure to identify concerns and any further guidance that will be needed to successfully implement the policy. NASA also notes that SMD has begun an Open Source Science Initiative (\$20M per year in cross-divisional support).

Finding 7- Sharing of lunar samples with China, and the Chang'e 5 mission, specifically, as well as future CLPS sample return missions. NASA responds by noting that is continuing to work within the necessary guidelines to reach sample-sharing agreements.

Finding 8- Request for additional Research and Analysis (R&A) support. NASA responds by agreeing that an R&A increase is necessary. NASA continues to work toward that end through the annual budgeting process.

Discussion

PAC Chair, Dr. Amy Mainzer, thanked Dr. Glaze for the comprehensive overview, and offered kudos to PSD for making excellent progress in spite of challenging conditions. Dr. Serina Diniega asked about the severity of COVID impacts on PSD activities. Dr. Glaze said that PSD was still experiencing impacts, and that NASA generally accepts that COVID is here to stay. She

felt that most of the mission teams that work on hardware have found a bit of a groove; the biggest challenge at present is with the new missions beginning Formulation phase. PSD has five missions in phase B right now, which have been affected by supply chain issues across the board, resulting in having to pull procurements earlier, among other things. Dr. Glaze expected these issues to continue to be a significant challenge, possibly leading to loss of opportunities and shifted schedules. There is much discussion under way to prevent big dollar impacts. Dr. Glaze noted that the loss of face-to-face meetings has had a large impact on the community, particularly on Early Career researchers. Dr. Rinehart added that the effect is very uneven; some people are having more significant challenges than others, and that there appears to be no common solution. Dr. Mainzer commented that on the mission side, the recognition of the need for procurement schedule changes is a sensible response. Dr. Mainzer said the whole community was pleased and excited by the hiring of Dr. Lori Leshin as the new Director of the Jet Propulsion Laboratory. Dr. Hope Ishii asked about the potential impacts of SPD-41 on R&A. Dr. Glaze said that current mission contracts and grants can adhere to the policies that govern their current terms, but encouraged people to adopt SPD-41 within resources. There is no need for waivers. However, Dr. Glaze noted that any new contracts and grants will need to comply with SPD-41. Dr. Dana Hurley commented that she hadn't seen a draft Announcement of Opportunity (AO) for the Discovery program. Dr. Glaze said there will definitely be a draft, but did not have the schedule on hand.

Dr. Mainzer asked how the PAC could help PSD grapple with the Decadal Survey. Dr. Glaze said that NASA's first response would probably be available at the time of the next PAC meeting, at which time there will be an opportunity to get feedback from the PAC, suggestions for implementation, recommendations on R&A and technology development, etc. By the Fall meeting, PSD will have more solid ideas. Dr. Mainzer said the hope was for the PAC to be able to do deeper dives on select subjects from the Decadal Survey. Dr. Dinega asked how many steps needed to be completed before the issuance of LOIs for partner-led missions with ESA. Dr. Glaze said that a LOI does not require a letter from the NASA side, as there is no commitment from the NASA side. She said she hadn't gotten the information about the M6 call in a timely fashion, but expected more details to be provided soon. Proposals are probably due in Fall, so NASA would need sufficient information from interested parties by August. Dr. Glaze encouraged people to step up so that NASA could contribute enough to participate in a phase A study, for example, with the M6 mission.

PSD Research and Analysis Update

Dr. Rinehart reported on the status of the R&A program, which is currently expecting two announcements: the first a call for people interested in working at Headquarters either as an IPA or detailee, and the second, a call for nominations for new PAC members, which will probably be issued by mid-March. Dr. Rinehart provided some reminders for ROSES 21: R&A is doing No-Budget experiment with the Discovery Data Analysis Program (DDAP), Dual Anonymous Peer Review (DAPR) is being implemented with all the Data Analysis programs; reviewers should continue to avoid duplicate proposals and to be very mindful of compliance with proposal guidelines. Selection rates look good for most of the programs, some at 50% or higher. The reason for this improved selection rate is that proposal pressure has dropped, in some cases quite a bit. Six of 8 programs have had at least a 30% reduction in submitted proposals (exceptions are the Exoplanet Research Program and Development and Advancement of Lunar Implementation).

According to statistics from 2017-20, there are no obvious differences in gender or PI race, in terms of dropouts. Two big differences are the number of unknowns and no-responses have decreased. Late career proposers went from 24% to 18%; Dr. Rinehart said he was not certain if this decrease was meaningful, and that there was no solid evidence that there is any particular driver. While there are many theories, Dr. Rinehart felt strongly that the driver was most likely COVID fatigue. There has also been a rise in uncosted (people not spending as fast as they are used to doing). Perhaps there is a reduction in idea generation due to the persistent lack of in-person conferences, frustration at low selection rates, or the burden of DAPR. Dr. Rinehart felt the last two hypotheses were probably not true, but he noted that similar reductions were being seen in other divisions. The Heliophysics Division (HPD) has definitely seen very similar results, and the Astrophysics Division (APD) maybe. The Earth Science Division's situation is a bit more complex. Dr. Rinehart reiterated that he was not sure the phenomenon was really a problem, and offered it as just an interesting bit of data for the community to know.

The No Due Date (NoDD) programs are still in the first year of a three-year trial period; while proposal pressure is down there too, Dr. Rinehart felt it was not an issue. So far, 63% of the NoDD proposals have been reviewed, with a 25% average selection rate. Average notification time is currently 157 days, but now that the panels are up and running, the times should decrease. Dr. Rinehart reminded the community of changes in the PMEF for ROSES21 and ROSES22: PSD is replacing the ROSES21 Planetary Major Equipment & Facilities (PMEF) call with the Planetary Science Enabling Facilities (PSEF) call. This is only the stand-alone part of PMEF; there will be no change to "appended" PMEF proposals relative to ROSES21. PSEF is the broader Facilities program that has been presented in past meetings. In ROSES22, PMEF will exist as a funding line but not as an appendix. "Appended" requests will be handled a bit differently. This is the only stand-alone part of PMEF, and there is no change to appended PMEF proposals, and are still dependent on the evolving FY21 budget numbers.

ROSES22 marks the change from PMEF into PSEF. Some other calls to watch for include the Apollo Next Generation Sample Analysis 2 (ANGSA-2); Analog Activities to Support Artemis Lunar Operations; Artemis III Geology Team; Martian Moons eXploration (MMX); and Preparatory Science Investigations for Europa. Under ROSES22, PDART will become PDAR, the reason being that the Planetary Data Ecosystem (PDE) Review highlighted some weaknesses in how tools are developed and supported. It might end up looking like the PMEF to PSEF transition. The biennial Interdisciplinary Consortia for Astrobiology Research (ICAR) call will occur this year. ICAR requires a Step-1 proposal, and awards are \$600k to \$1M per year. Of the five RCNs in ICAR, Nexus for Exoplanet System Science (NExSS) will be reviewed this year, after the release of the Decadal Survey. The tentative schedule for ICAR is for an AO on 15 April, with Step-1 proposals due in September, and Step-2s in December.

High-End Computing (HEC), in the second quarter of 2022, is already severely over-allocated at the High-End Computing Capability facility (HECC) and at the limit at the NASA Center for Climate Simulation (NCCS), in part due to commitments made in previous years by projects with multi-year allocations. PSD has one of the smallest allocations at SMD, but PSD does have one mega-user that dominates the usage. PSD is looking at better ways to manage its HEC allocation.

Dr. Rinehart presented details of PSD funding that could be made available for community service, in response to a PAC finding, and cautioned that the estimates in the table are just estimates, and on the low side. The total amount of funding is roughly \$15M annually, or about one quarter of R&A's annual budget for new awards. He noted that paying PAC members for service is legally fraught, and that SMD decisions are needed for many pathways. There can be unintended consequences for some approaches. Providing funding for Mission Definition Team (MDT) members is possible, as well as funding for Workforce/Facility Reviews. Dr. Rinehart cautioned, however, that PSD can afford some of the contents of the presented table, but not all.

Dr. Rinehart provided some thoughts on IDEA, and noted that all of PSD is committed to the ideals of IDEA. There are many IDEA activities across the division which have not yet been documented, and PSD is working to rectify this. Within the R&A group, the general approach is to improve internally, look at where improvements can be made, and determine who will benefit, who will pay in both money and time, and whether impacts are measurable, followed by choosing a few things to do and doing them well, getting them established, and moving on to the next. There are many things that people want to do, thus it is necessary to be selective and careful. Bandwidth is limited for new activities, and R&A staff are already going above and beyond.

“PAC 101”

Dr. Rinehart presented a primer for new PAC members, first briefly reviewing the organization of NASA. PAC is a Federal Advisory Committee Act (FACA) committee, established to provide information and advice on a broad range of issues affecting federal policies and programs.

FACA committees should:

- Provide advice that is relevant, objective, and open to the public
- Act promptly to complete their work
- Comply with reasonable cost controls and record-keeping requirements (this is largely the function of the Executive Secretary)

Every FACA committee has a charter, importantly providing advice and analysis, and also functions as a public forum. The PAC exists within a larger context: the PAC provides findings and recommendations to the Planetary Science Division, and input to the NASA Advisory Council (NAC) Science Committee. The NAC Science Committee provides findings and recommendations at the SMD level, and inputs to the whole NAC. The NAC provides advice to all of NASA. Likewise, the Space Studies Board provides advice to NASA but is under the umbrella of the National Academies. Other Academies committees (e.g., the Decadal Committees, Committee on Astrobiology and Planetary Sciences, CAPS, and topical study committees) provide additional advice to NASA at various levels.

In terms of the practical role of the PAC, the PSD does not restrict PAC discussions, but it does provide agendas for meetings. It is important to note that the PAC advises and recommends, but PSD is not obligated to follow advice and recommendations. Dr. Rinehart commented that while the PAC is welcome to make requests for information, it must be noted, that such requests involve a lot of time and effort from an already overtaxed staff, so it is good for the requester to

know what one is asking for and why. The PAC is also not an oversight body; no FACA committee can direct Agency activity or the activity of Agency employees.

The PAC meets three to four times per year. Dr. Rinehart provided a rough timeline for each meeting, as well as meeting requirements, such as adherence to agendas. A professional notetaker takes the minutes of these meetings, which are then distributed for edits and clarifications before they are published. Dr. Rinehart noted that it would be good practice for PAC members to include a NASA civil servant (noting that the Executive Secretary is appropriate for most such conversations) if there are any discussions or issues with findings, to cover Freedom of Information Act (FOIA) requests. Findings do not require a response, but recommendations do. Specific, high-priority advice is most helpful. Too many findings and recommendations tend to get diluted. In terms of legal restrictions, Dr. Rinehart noted that civil servants cannot lobby Congress or ask the PAC to do so; it is against the law. NASA also cannot reallocate money between budget wedges without approval from Congress and the Office of Management and Budget (OMB).

Because members of FACA committees are considered Special Government Employees (SGEs) and effectively a subset of civil servants, thus they must disclose their finances, and must recuse themselves from any discussions that involve a material conflict of interest. The Hatch Act states that SGEs/civil servants are apolitical, and cannot advocate for a particular candidate, but can advocate for topics or issues. Dr. Rinehart provided some sample reasons for recusals, such as being a PI on a specific mission under committee discussion

Dr. Rinehart briefly reviewed the Federal Budget process, the President's Budget Request (PBR), House and Senate deliberations and appropriations, and the effects of Continuing Resolutions. Once a budget is passed, NASA makes an Operating Plan. NASA can be working on different aspects of three different budgets at the same time: for instance NASA is currently juggling Operating Plans and CRs, for FY22, 23, 24; it can get very hectic during budget planning periods. Dr. Rinehart ended the presentation by noting that the PAC can also make NASA-wide recommendations, beyond PSD, by elevating recommendations to the NAC. Dr. Mainzer indicated that as a member of the Science Committee, she presented all PAC findings to the NAC so that they can at least be discussed.

Dr. Jennifer Glass thanked Dr. Rinehart for the comprehensive presentation. Dr. Diniega thanked Dr. Rinehart for pulling together the table of community service, and thought it was important to point out that the community was effectively providing \$15M worth of unpaid labor. Dr. Mainzer commented in this context that the overall R&A budget is about \$200M, and that new awards run at about 60M per year. Dr. Rinehart said that he appreciated Dr. Diniega's perspective, and agreed that there were institutional differences in funding community services, but that some of the funds present in the table might be double-counted, in that some people in the community are already getting paid by their institutions, either through overhead or established grants, to do community service; these latter situations might bring about legal issues, or unintended consequences. Dr. Diniega felt that it was an important conversation to be having, especially in the IDEA area. Dr. Rinehart commented that if NASA pays people for white papers, NASA can choose which ideas to support before hearing them ; nobody wants NASA to be a gatekeeper for opinions. He suggested the PAC select one or two things, such as

state of profession or workforce reviews, as these activities are the most likely to help over the long run while not running afoul of legal restrictions. Drs. Mainzer and Diniega agreed with this suggestion. Dr. Rinehart recommended that community members consult with their respective institutions, as it is much easier for a university to cover these community service costs, than it is for NASA to do this globally. Once possibilities are established, the PAC should ask NASA about how it can help. Dr. Diniega commented that it's maybe easier for NASA to push on the institutions, rather than the individual, recognizing that NASA cannot tell institutions how to spend their money. Dr. Mainzer noted that NASA can help keep the topic in the spotlight with continued emphasis.

Public comment period

Dr. Moses Milazzo asked about the status of Decadal Survey white papers on the IDEA topic. Dr. Rinehart said that NASA was looking forward to the Decadal's response to these papers, Dr. Julie Rathbun commented that with respect to R&A proposal pressure, the numbers of male proposers increased, while the number of females remained flat, and asked if this was not a significant difference. Dr. Rinehart said that as there was a one-sigma uncertainty on those numbers, the 4% shift not significant. His other observation was that the "no-response" category was generally male.

Dr. Diniega commented that it sounded like there was a lot of work in progress for determining solutions to the HEC allocation problem. Dr. Rinehart said that this was indeed the case and that the PAC would be hearing more about it in future meetings. At present, HEC is complicated and messy, and it's hard to figure out what is wrong. His personal take on the problem is that the model for HEC allocation planning works well unless something changes; it's not a resilient model. Dr. Walter Kiefer recommended consulting the National Science Foundation (NSF) on its HEC model. Dr. Rinehart said that NASA did reach out to NSF about their proposal statistics, and felt these would be worth some discussion. Dr. Rivera-Valetin asked if there will there be an opportunity through either an RFI or Town Hall for the community to provide feedback on the HEC situation. Dr. Rinehart said that he did not know, and that the HEC allocation model might need a fundamental re-think, perhaps through an RFI. There is one PSD mega-user, previously mentioned, that uses up more than one-half of the PSD allocation.

Dr. Mainzer asked how the ICAR research framework could help the community to understand sample science. Dr. Glaze said that she did think the RCN framework is applicable to many areas, and that sample science could be a focus of one of the existing RCNs. Dr. Mary Voytek noted that the PCE3 RCN is probably most applicable to sample science, as it focuses on prebiotic chemistry in early Earth biology. There is also specific funding at the Goddard Space Flight Center (GSFC) specifically for Mars Sample Return (MSR). The other is the Network for Life Detection, which also deals with MSR. Dr. Lindsay Hays commented that the idea of RCNs is based on cross-disciplinary science questions; NASA is already developing community sample working groups on the Mars2020 Perseverance rover, for instance, so astrobiology is pulled along as a natural consequence.

Dr. Milazzo asked about the availability of metadata for cross-collaborations. Dr. Rinehart answered in the affirmative. Question from Marufa Bhuiyan: Would NASA be interested in virtual Moonbase/Marsbase projects? Dr. Rinehart asked the inquirer to amplify on the question

and did not receive an answer. Asked to name her greatest concern for PSD, Dr. Glaze said that the near-term concern was the challenge across the board in getting additional funding for 2022 and into 2023, and keeping everyone covered. She noted, however, that every mission is actually doing an amazing job, and making great progress. There is nothing in the portfolio that is lagging. Dr. Diniega asked about a timeline for extended mission proposals. Dr. Glaze said that every mission that has completed its prime mission, except Juno, is going through a Senior Review; NASA expects to announce the results publicly in mid-April. Each mission is reviewed independently, with its own panel, and is asked to demonstrate both the scientific programmatic benefits of the mission, as well as report on the health of spacecraft. Dr. Mainzer asked about honoraria as a way of rewarding labor for sitting on review panels. Dr. Rinehart said that NASA increased the honoraria to about \$350/day, \$400/day for Chair, which corresponds to an annual salary of over 100k. There have been suggestions of doubling this amount. NASA has based the current honorarium amount based on the time people spend around the reviews (pre-panel reading, etc.). Eight proposals is one to two days of solid work. There is still the question of different institution practices; NASA does not want to throw money at people who don't need it. Dr. Diniega commented that it might still be a good effort to help fill a gap overall. Dr. Rinehart said that NASA can also pay per proposal; this is being done in one program in R&A.

Analysis Group (AG) reports

Mercury Exploration Analysis Group (MExAG)

MExAG Chair Steve Hauck reported on the group's most recent annual meeting, and detailed major findings. First, MExAG is committed to Inclusivity, Diversity, Equity, and Accessibility (IDEA) principles, supports the efforts of the IDEA Working Group, and encourages NASA to formalize its relationship to the Working Group, in consultation with the other AGs. Second, MExAG is concerned that since the New Frontiers-5 call has been delayed, and that the Decadal Survey has decided to "punt" on its list of planetary targets, New Frontiers destination lists are relying on guidance that is more than 10 years old. Given this situation, NASA should reevaluate destinations, similar to what it had done previously with the New Frontiers-4 call. Third, given that BepiColombo has increased the number of Interdisciplinary Scientist (IDS)/Guest Investigators (GIs) slots, MExAG is interested in how many US GIs NASA plans to fund for this mission. Fourth, MExAG finds that because Radioisotope Power Systems (RPS) are critical for extreme environments and for operations at night or in permanently shadowed regions (PSRs), MExAG supports a full accounting of how RPS can be used to support Solar System exploration. Fifth, while MExAG supports open science principles, it is concerned about the ramifications of the SPD-41 Scientific Information Policy. Sixth, MExAG requests that, given the many challenges to optical observations of Mercury, NASA facilitate access to viewing time to both optical and radar ground-based facilities, especially given the loss of the Arecibo radar telescope facility.

Small Bodies Analysis Group (SBAG)

SBAG Chair Dr. Bonnie Buratti gave an update on the latest SBAG meeting, noting that the main finding that requires action is the SBAG finding on SPD-41, which SBAG finds to be ambiguous. Furthermore, SBAG finds that SPD-41 might have unintended consequences, and that some smaller institutions may be at a disadvantage in implementing the policy. SBAG suggests a series of workshops in order to identify and clarify unintended consequences.

Other ongoing findings that do not require action: SBAG is encouraged by NASA's radar recovery abilities and supports further progress. SBAG fully supports IDEA and the establishment of an LPI-supported website, containing all the relevant resources. Finally, SBAG is pleased with NASA's support for the NEO Surveillance Mission, and is encouraged by its progress.

Venus Exploration Analysis Group (VEXAG)

Dr. Darby Dyar, VEXAG Chair, noted that this would be her last meeting as she rotates off the AG. The latest VEXAG meeting, VEXAG 2021, resulted in 11 findings, three of which were brought to the PAC's attention: First, VEXAG is thrilled that there are new Venus missions and is looking forward to the release of the new Decadal Survey. VEXAG finds further that NASA should establish a Venus program, and keep Venus on the list for New Frontiers.

VEXAG finds that the NASA Space Technology Mission Directorate (STMD) should restart the assessment and development of long-duration power systems generally, including those that can directly be applied to Venus exploration (surface assets in particular). Dr. Dyar highlighted a third VEXAG finding, which is concerned about the safety of attendees at the Lunar and Planetary Science Conference (LPSC) in Texas. Many LPSC attendees are students, and some reported experiences suggest that LPSC might do well to be rotated out of the state of Texas, as there is no longer a compelling link between the conference and Johnson Space Center.

Mars Exploration Program Analysis Group (MEPAG)

Dr. Aileen Yingst, MEPAG Chair, detailed the arrival of new members to the MEPAG Steering Committee (Colin Dundas and Briony Horgan) and Goals Committee (Christina Viviano). She noted that Jonathan Bapst and Mike Mischna are the latest additions to the Mars Program Office at JPL. MEPAG held its most recent meeting in early February, which featured a strong international presence, including UAE. The community is very excited about active missions at Mars.

MEPAG findings include applause and encouragement for the continued productivity of Mars missions, and for the establishment of the iMIM MDT. The community is prepared to support other science missions in parallel with MSR. MEPAG also issued a finding to amplify and encourage support for IDEA, which is particularly important for MEPAG, in that NASA as an agency has far more power than that associated with its many small distributed grants. MEPAG also finds that previously aired concerns about the location of LPSC constitute a question of safety and not politics, and that all members of the science community should feel safe and heard. MEPAG intends to revisit this issue at its next meeting.

Mapping and Planetary Spatial Infrastructure Team (MAPSIT)

MAPSIT Chair Dr. Brad Thomson provided a status of the team, first welcoming the appointment of Dr. Moses Milazzo as the first Chief Scientist for the PDE, and as an *ex officio* member of MAPSIT, affording the AG an independent view. MAPSIT endorses the final report of the Lunar Critical Data Product Special Action Team (LCDP-SAT), a joint LEAG-MAPSIT committee, which deals with the immediate steps to be taken to provide data support for the Artemis lunar missions. MAPSIT also issued a finding on SPD-41, which supports NASA's push toward to open data as a good, laudatory, meritorious goal, but which was concerned about its vague language, that could possibly lead to multiple standards without additional funding (e.g.

newly acquired data must be in PDS4 format; this is a big change and it is expensive to convert data to the new standard). Dr. Thomson agreed with the philosophy that “data should just work. MAPSIT feels that SPD-41 and its potential effects require more attention and thought.

Extraterrestrial Materials Analysis Group (ExMAG)

Dr. Jemma Davidson, ExMAG Vice-Chair, reported on the group, which is composed of seven subcommittees, overseen by an Executive Committee. ExMAG recently added three new members to its Executive Committee, and is planning for its next meeting in mid-April. Dr. Davidson highlighted ExMAG findings on SPD-41, and its interest in knowing more about the NoDD programs in R&A. Dr. Davidson re-amplified an ExMAG finding on the community’s interest in acquiring access to Chang’e 5 samples for analysis, and thanked both the PAC for its support, and Dr. Glaze for her earlier comments. The finding might be broadened to Antarctic samples as well. Asked if it were possible to arrange for multinational sharing (of samples), Dr. Davidson said that she was not clear on pathway forward, but would like to find out more.

Outer Planets Analysis Group (OPAG)

Dr. Linda Spilker, OPAG Chair, noted that the group had postponed its meeting to the Fall in order to accommodate the release of the Decadal Survey, and brought forward previous OPAG findings for re-emphasis and for which PAC had provided responses:

- RPS Development
- Cost provisions and radioisotope power for future Discovery and New Frontiers AOs
- Schedule for future Discovery and New Frontiers AOs

Dr. Spilker requested that the PAC continue to advocate for RPS development and production. OPAG also wishes to see a continuation of phase E and launch vehicle exclusions in the Discovery and New Frontiers programs. OPAG supports the IDEA WG, and feels it is important for the community to support these efforts.

Lunar Exploration Analysis Group (LEAG)

Dr. Jose Hurtado, LEAG Technology Chair, noted that the LEAG’s annual meeting was to be held in August of this year, and welcomed Dr. Ben Bussey to the AG as the new Strategic Roadmap Chair. The LEAG’s Analog Objectives for Artemis Specific Action Team (AOA-SAT) is complete and has produced a final report. The LEAG has established a new Continuous Lunar Orbital Capabilities SAT (CLOC-SAT) to develop integrated findings on the need for ongoing remote sensing around the Moon. The kickoff for this SAT is happening right now, and there will be an open call for membership, with a final report due in August 2022.

Dr. Hurtado detailed a LEAG finding supporting inclusivity and diversity, ethical and accountable exploration, and cultural sensitivity (e.g., human remains on Moon), and the ethical considerations of using the Moon as resource. The LEAG has also responded to the RFI on SPD-41.

Dr. Hurtado brought forth the LEAG’s major finding, that the PAC recommend the development of a plan for continuous remote sensing assets around the Moon, as the Lunar Reconnaissance Orbiter (LRO) ages, and the development of an orbital plan to activate during or after LRO’s tenure.

Exoplanet Analysis Group (ExoPAG)

Dr. Michael Meyer made some brief remarks on ExoPAG activities: there is an APAC meeting coming up in March, and a face-to-face ExoPAG meeting planned for June. The ExoPAG is closing out Study Analysis Groups (SAGs) on the impact of stellar activity on planetary transit measurements, and the utility of stellar databases for targets of new exoplanet missions, and will propose a new SAG on zodiacal dust and debris discs. The ExoPAG supports a cross-SAG on the barriers to participation in NASA space science, and looks forward to new opportunities stemming from the Astro 2020 Decadal Survey, in particular the preparatory science program for the new Great Observatories initiative. There will be increasing discussion of issues related to habitability and the remote spectroscopic search for life on other planets. They will involve collaborative discussions with colleagues in NExSS who also study such issues. The ExoPAG continues to monitor development on astrophysical balloon platforms, which many be relevant for the planetary science community. There are also some concerns with respect to SPD-41.

General Discussion

Dr. Mainzer commented that SPD-41 still a hot topic for everyone, while Dr. Glaze urged the community to provide feedback by the 4 March deadline, as NASA really needs to hear from the community. Everyone that has a concern should express the concern. Dr. Rinehart said he was going to ask the cross-AG IDEA WG to report directly to the PAC. Dr. Diniega supported the idea, while commenting that each AG should also work on their own priorities.

Dr. Mainzer noted that RPS has been coming up repeatedly, and while conceding that it needs more discussion, she was not sure a finding would be necessary until after the Decadal Survey was released. PAC members agreed. Dr. Hurley asked if the PAC was required to approve/recommend SATs and requested studies. Dr. Glaze said that these do not require a PAC recommendation, but PSD would welcome some comments on priorities. Dr. Sarah Noble said she would be interested to see results of the CLOC-SAT, which would inform a next-steps plan for SMD. Dr. Mainzer said that LRO had been wonderfully successful, and that it would probably be good to have another orbiter present once there are landed assets on the Moon. Dr. Justin Hagerty asked Dr. Hurtado to comment further on the LEAG's concerns with data archiving. Dr. Hurtado said the key issues were longevity of software and data products, in terms of who is responsible for these, and who governs compliance with standards. Dr. Diniega asked about the focus of a potential formal Venus program in SMD: is there any consideration of present missions, or would the program focus on future missions? Dr. Dyar said the VEXAG conceived of the program being mostly forward looking, as NASA and Dr. Glaze have already stood up a coordinating office for present Venus missions. The VEXAG has completed planning documents regarding such a program, which can be found on the LPI website. The Venus community feels that the "follow the water" path to Venus is even more relevant than it is for Mars, because Venus is thought to have harbored water for 3 billion years.

Dr. Rinehart reminded everyone that SPD-41 is a policy document, and thus does not include implementation details. It is not a flaw in the document, it is an intentional omission. However, he recommended that the community feel free to comment on any implementation concerns before the 4 March deadline.

Findings and Recommendations Discussion

The PAC discussed the scope of concerns about conference locations. Dr. Mainzer noted that the safety of participants at a conference is extremely important, but framing the question posed challenges. Dr. Diniega suggested the NASA Code of Conduct (CoC) might apply to the matter, or that the PAC could suggest alternative venues, or other ways of attending. Dr. Glaze said that NASA is 100% onboard for accessibility and safety, but with relevant criteria. By moving conferences out of a particular state, NASA might be seen to depriving local, underserved businesses. Who decides what is an appropriate safe place to hold a conference? Dr. Dyar suggested making conferences more accessible to a larger percentage of the community, and specifically to a geographically large range of participants. Dr. Glaze said that identifying a safe place is a moving target, and that registration fees grow higher when adding the virtual component to a conference. Dr. Kiefer commented that hybrid meetings are more expensive, but they do help accessibility. The other issue is handling large numbers of international participants. It will also take longer to site these conferences over a number of cities. There is no perfect answer.

Dr. Mainzer commented that NASA can enforce CoC, while enhancing accessibility and providing closed captioning; in addition, NASA meetings do tend to rotate to accommodate multiple sites. Dr. Kiefer reported that conversations with JSC personnel indicate that they do not feel that their connection with LPSC has been severed. Sample analysis may become an increasingly important part of PSD. Dr. Diniega asked whether the PAC could actually weigh on the location of LPSC. Dr. Rinehart felt that singling out LPSC would be tricky, and that it would be best for the PAC to comment on the importance of CoC, and accessibility. Dr. Glaze said it was a question of scope, and that the PAC might suggest that LPSC be moved around. Dr. Mainzer said it would be possible to rely on NASA's set of core values, and encourage meeting planning to take those things into account. Dr. Rinehart asked if these guidelines would apply to every conference NASA funds, and did think it was worthwhile for the PAC to comment. Dr. Glass asked what issues were driving LPSC concerns. Dr. Rinehart said the concerns were based on individual experiences, and was not comfortable discussing particulars. Dr. Yingst said that to her knowledge it was a question of hostility toward trans-gender individuals, and some questions involved with using gender-specific facilities in public places (hotels, airports). Dr. Diniega felt the PAC should not decide what is safe, and advised NASA to use the Cross-AG IDEA group to come up with guidance. Dr. Justin Filiberto commented that as a non-binary, he felt it was necessary to consult the people who are most affected in order to determine a finding, and that the PAC should table a finding until such time. It's a bigger issue than LPSC. He said he had sent an email earlier in the day to start the discussion. Dr. Rinehart noted that the LPI has also started a group specifically for this purpose, and suggested that they be put on the agenda for June. Dr. Diniega said the LPI group is also managing the AGs, and it would be good to hear from them. Dr. Buratti noted that access to women's healthcare is critical, and recounted a personal incident wherein state restrictions on certain procedures would have led to her death. Any woman of child-bearing age is in danger if they go to states where these specific procedures are banned.

Dr. Kiefer commented on the radioisotopic power issue and asked if there were a need to talk about surface power, specifically. He added that MEPAG's SPD-41 finding had talked about an apparent requirement for switching mission data from PDS3 to PDS4 formats. Dr. Mainzer

reminded the PAC that SPD-41 is still out for comment, and that the PAC had a prior finding on it. She worried about being too prescriptive. Dr. Kiefer felt the switch to the new standard is a separate issue, and that the PAC should hear more about the implications of the switch in June or October. Dr. Glaze agreed that the issue was separate from SPD-41 and that the PDS4 transition is going slowly. If the PAC has technical concerns about file size, the tech folks should come in and explain. The PAC could use a fuller discussion from the people involved on both sides. Dr. Kiefer suggested a finding on hearing from both sides with the intent of formulating a recommendation. Dr. Rinehart noted that there is a cost to keeping old data around. Dr. Glaze said that the PDS4 format does provide more metadata to facilitate searching and using data, and that PDS3 is very clunky. Dr. Becky McCauley-Rench commented that there is additional value in PDS4 that is more than the sum of its parts. Dr. Kiefer suggested a finding that read: The PAC would like a briefing from NASA about the pros and cons of converting to PDS4, for informational purposes.

Dr. Mainzer said she didn't think a finding on PDS4 was necessary at present, but that SPD-41 did. Dr. Conor Nixon suggested a finding on the drop in ROSES proposals, requesting that NASA keep an eye on it. Dr. Glaze and Dr. Rinehart felt that there was not enough data to indicate an issue as yet. Dr. Glaze suggested the AGs do informal polls inquiring as to why the proposals are dropping. Dr. Mainzer recommended a more general work force study, which might be timely, given some COVID issues that are not entirely addressed by the Decadal Survey. Dr. Glaze thought a state of the profession study could be informative, but that another organization might have to conduct it. Dr. Rinehart said that the Decadal Survey had done this work relatively recently, and that it would take another full year to do a separate study. Dr. Glaze agreed with Dr. Rinehart in that the Survey might provide a baseline, but felt that yet more data was needed to see whether the drop in proposals is a trend or a blip.

Dr. Mainzer asked if a finding on the need for continued workforce surveys would be helpful. Drs. Glaze and Rinehart agreed that this might be a good assignment for the cross-AG Working Group.

Main Findings

- Engage cross-AG WG on a number of topics
- SPD-41
- Commentary on community service, where to prioritize efforts. What community service is being done, what kind of unfunded labor is out there?

The PAC deferred findings on for RPS, the Discovery/New Frontiers schedule, and PDS3/PDS4 concerns.

Dr. Rinehart wrapped up the proceedings and reminded the PAC that FACA rules required that any findings and recommendations be approved by consensus. Dr. Rinehart also expressed his appreciation and noted that the next meeting in June was planned as a face-to-face meeting at Headquarters. Dr. Mainzer thanked everyone for their candid opinions. Dr. Rinehart adjourned the meeting.

Appendix A
Attendees

PAC Members

Amy Mainzer, **Chair**, University of Arizona
Lisa Danielson, Los Alamos National Laboratory
Serina Diniega, Jet Propulsion Laboratory
Justin Filiberto, NASA Johnson Space Center
Jennifer Glass, Georgia Institute of Technology
Justin Hagerty, United States Geological Survey
Dana Hurley, Johns Hopkins University Applied Physics Laboratory
Walter Kiefer, Lunar and Planetary Institute
Hope Ishii, University of Hawaii
D'Arcy Meyer-Dombard, University of Illinois at Chicago
Conor Nixon, NASA Goddard Space Flight Center
Tyler Robinson, Northern Arizona University
Joseph Westlake, Johns Hopkins University Applied Physics Laboratory
Stephen Rinehart, Executive Secretary, NASA Headquarters

Attendees

| | | |
|--------------------|--------------------|-----------------------|
| Lori Glaze | Jamie Riggs | Jennifer Edmunson |
| Shoshana Weider | Mary Voytek | Mallory Kinczyk |
| Barbara Cohen | Anne Verbiscer | Robert Herrick |
| Bonnie Buratti | Michael Lienhard | Tammy Dickinson |
| R. Aileen Yingst | Emma Bullock | Joshua Knicely |
| Joel Kearns | Curt Niebur | Ed Rivera-Valentin |
| Noam Izenberg | Ghassem Asrar | Elaine Denning |
| Jose Hurtado | Richard Zurek | Jennifer Scully |
| Michael Meyer | Melissa Morris | Robert Pappalardo |
| Eric Ianson | Paul Byrne | Karl Mitchell |
| Brad Thomson | Luisa Fernanda | Meagan Thompson |
| Jeff Gramling | Zambrano Marin | John Whitehead |
| Tiffany Morgan | Sarah Noble | Tim Lister |
| Linda Spilker | Anthony Travis | David Millman |
| Mike Fanelli | Garrett Shull | Chris Fowler |
| Monty Di Biasi | Jemma Davidson | Hunter Williams |
| Prajakta Mane | Griffin Reinecke | Nathaniel Putzig |
| Cynthia Dinwiddie | Gene Mikulka | Jen Schmidt |
| Gretchen McCartney | Marcella Yant | Kimberly Ennico-Smith |
| Brett Denevi | Karlheinz Trattner | Michael Dahlin |
| Chris Dateo | Elizabeth Esther | Michael Poston |
| Lindsay Hays | Phil Scott | Jeff Grossman |
| Kamrul Choudhury | James Lochner | Erin Morton |
| John Cooper | J Andy Spry | David Eisenman |
| John Andrews | Bo Trieu | Patrick Taylor |

Planetary Science Advisory Committee, February 15, 2022

Julie Rathbun
David Chelmins
Zhengwei Hu
Shawn Brooks
Shannon Hibbard
Dave Draper
Bobby Fogel
Shanshan Yu
Julie Castillo
Michael Kelley
Candy Hansen
Samuel Howell
James Keane
Darby Dyar
Jeff Foust
Ujjwal Raut
J. Michael Newman
Van Kane
Moses Milazzo
Mark Hofstadter
Dragos Zaharescu
Marufa Akhter Bhuiyan
Brian Harvey
John Grunsfeld
Krista Soderlund
Thomas Wagner
Kelly Miller
Gopal Vasudevan
Rosaly Lopes

Raha Hakimdavar
Lewis Groswald
Antony Trinh
Kaveh Pahlevan
Linda Karanian
Meghan Bartels
Kathleen Vander Kaaden
Adriana Ocampo
Rebecca McCauley-Rench
Juergen Nussbaumer
David Atkinson
Carl Gelderloos
Scott Perl
Edith Fayolle
Devin Schrader
Lucas Paganini
George Giakos
Therese Jorgensen
Aaron Burton
Kat Volk
Frances Rivera-Hernandez
Tom Statler
Alfred McEwen
James Green
Michael Mischna
Justin Lawrence
Sylvie Espinasse
LaJuan Moore
Mitch Schulte

Louise Prockter
Carmen Cromartie
Larry Nittler
Caleb Fassett
Amanda Nahm
Kate Burgess
Alan Thurgood
Igor Aleinov
Paul Abell
Paul Voosen
Sara Pierson
Joan Zimmermann
Sidney Sun
Greg Garner
Nancy Kiang
Ethiraj Venkatapathy
Richard Davis
Henry Throop
Kristian Mueller
Steven Hauck
Doris Daou
Alana Johnson
Teresa Jensen
David Gaba
James Lui
Mark Fonda
Megan Ansdell

Appendix B
Agenda

NASA Planetary Science Advisory Committee (PAC) Meeting
February 15 2022
VIRTUAL MEETING – AGENDA

Public Connection Information

Webex URL:

<https://nasaevents.webex.com/nasaevents/onstage/g.php?MTID=eafo2abdfed7a5acf5468be483fd15e67>

Event meeting number: 2760 600 4415

Password: QTeyX3sXA24

ACCESSIBILITY

Captioning will be provided for this meeting. We are committed to providing equal access to this meeting for all participants. If you need alternative formats or other reasonable accommodations, please contact Ms. KarShelia Kinard, Science Mission Directorate, NASA Headquarters, Washington, DC 20546, (202) 358-2355 or karshelia.kinard@nasa.gov.

Agenda

| Item & Speaker | Nov 15 (Eastern) |
|---|-------------------------|
| Welcome/Around the table Stephen Rinehart | 12.00–12.05 |
| Planetary Science Division (PSD) Update Lori Glaze | 12.05–13.05 |
| PAC Discussion/Q&A | 13.05–13.15 |
| Research & Analysis (R&A) Program Update & PAC/Budget Primer Stephen Rinehart | 13.15–14.15 |
| PAC Discussion/Q&A | 14.15–14.30 |

| | |
|---|---------------|
| Public Q&A | 14.30–15.00 |
| BREAK | 15.00–16.00 |
| Assessment/Analysis Group (AG) Discussion Period AG Representatives | 16.00–17.00 |
| PAC Discussion | 17.00 – 18.00 |
| Adjourn | 18.00 |

Appendix C
Membership

Amy Mainzer, **Chair**
University of Arizona

Lisa Danielson
Los Alamos National Laboratory

Serina Diniega
Jet Propulsion Laboratory

Justin Filiberto
NASA Johnson Space Center

Jennifer Glass
Georgia Institute of Technology

Justin Hagerty
United States Geological Survey

Dana Hurley
Johns Hopkins University Applied Physics Laboratory

Walter Kiefer
Lunar and Planetary Institute

Hope Ishii
University of Hawaii

D'Arcy Meyer-Dombard
University of Illinois at Chicago

Conor Nixon
NASA Goddard Space Flight Center

Tyler Robinson
Northern Arizona University

Joseph Westlake
Johns Hopkins University Applied Physics Laboratory

Appendix D
Presentations

1. Planetary Science Division Update; *Lori Glaze*
2. PSD Research and Analysis Update; *Stephen Rinehart*
3. PAC “101” Committee Primer; *Stephen Rinehart*
4. Mercury Exploration Analysis Group (MExAG); *Steve Hauck*
5. Venus Exploration Analysis Group (VEXAG) Update; *Darby Dyar*
6. Mars Exploration Program Analysis Group (MEPAG) Update; *R. Aileen Yingst*
7. Mapping and Planetary Spatial Infrastructure Team (MAPSIT); *Brad Thomson*
8. Extraterrestrial Materials Analysis Group (ExMAG); *Jemma Davidson*
9. Small Bodies Assessment Group (SBAG); *Bonnie Buratti*
10. Outer Planet Assessment Group (OPAG) Update; *Linda Spilker*
11. Lunar Exploration Analysis Group (LEAG) Update; *Jose Hurtado*
12. Exoplanet Program Analysis Group (ExoPAG) Report; *Michael Meyer*

Appendix E Chat

02/15/2022 12:00:28 PM from Serina Diniega (Ext) to Everyone: good morning

02/15/2022 12:04:04 PM from Serina Diniega (Ext) to Everyone: since we have some time: the cc is not working for me. The multimedia viewer is open but I have a yellow triangle and no words appearing.

02/15/2022 12:04:49 PM from Serina Diniega (Ext) to Everyone: we probably can't troubleshoot in realtime now, just an FYI

02/15/2022 12:06:25 PM from Serina Diniega (Ext) to Everyone: perhaps I'll try to figure it out during the break

02/15/2022 12:10:53 PM from Serina Diniega (Ext) to All Panelists: PAC members - I will email a link for a notes document

02/15/2022 13:22:38 PM from Julie Rathbun (Ext) to All Panelists: It looks like Men went from 57% to 61%, and all the change in "No response" was due to men. Is that not significant?

02/15/2022 14:38:55 PM from Nathaniel Putzig (Ext) to All Panelists: I think Julie may be suggesting that we have not made much progress in equalizing differences since 2017.

02/15/2022 15:00:31 PM from Nathaniel Putzig (Ext) to All Panelists: Some institutions require employees to sign over honoraria to the company.

02/15/2022 16:36:09 PM from Jennifer Glass (Ext) to All Panelists: I'm curious for more info about the LPSC location stuff. I'm unaware of exactly what the issues are ... Is it related to TX laws or something else?

02/15/2022 16:37:36 PM from Serina Diniega (Ext) to All Panelists: Jennifer: in brief, TX laws were a recent prompt, but concerns on many fronts have been simmering for a while. (and check out other comments on our shared google doc)

02/15/2022 16:40:23 PM from Serina Diniega (Ext) to All Panelists: AG reps, well done on moving so quickly through the important materials!

02/15/2022 16:40:51 PM from Brad Thomson (Ext) to All Panelists: Huge thanks to Shoshana for driving the slides

02/15/2022 16:42:35 PM from Michael Meyer (Ext) to All Panelists: @Amy - I am happy to explain ExoPAG issues of relevance to PAC, but I do not have findings for PAC.

02/15/2022 16:44:49 PM from Darby Dyar (Ext) to All Panelists: WRT to LPSC, I think the even bigger question is "Why is it always in Texas?" Historically there was an association with JSC and the old LPI, but that no longer prevails. Moreover, many LPI personnel actually spend the night in

hotel rooms. So the main additional cost to have it elsewhere is shipping supplies and travel for LPI personnel.

02/15/2022 16:45:25 PM from Darby Dyar (Ext) to All Panelists: It needs to be moved around to make it more accessible to more students.

02/15/2022 16:46:44 PM from Noam Izenberg (Ext) to All Panelists: At the moment LPSC is "local" to a very small segment of its student attendees. Going coastal on different years - or even the midwest, would make it occasionally local to a much wider population.

02/15/2022 16:47:15 PM from Jennifer Glass (Ext) to All Panelists: OK but I also heard "safety" concerns?

02/15/2022 16:48:12 PM from Noam Izenberg (Ext) to All Panelists: That is at least partly related to legislation - not restricted to TX - that makes a non-trivial population within the community feel unsafe.

02/15/2022 16:48:24 PM from Brad Thomson (Ext) to All Panelists: It needs to be near an international airport to continue to attract robust international participation

02/15/2022 16:49:14 PM from Darby Dyar (Ext) to All Panelists: Yes, these have been issues between students and security personnel at the Woodlands and bathroom use. LPI is aware and is taking steps to ameliorate. Superimposed on that are issues about laws in Texas for the LGBT community.

02/15/2022 16:50:19 PM from Jennifer Glass (Ext) to All Panelists: @Noam, sadly, as you hint, those laws expanding to a significant portion of the country and even the parts w/o those laws are often prohibitively expensive or unfriendly (or perceived as unfriendly) to some members.... tough to find somewhere non-problematic (sigh)

02/15/2022 16:51:31 PM from Jennifer Glass (Ext) to All Panelists: @Darby, thanks for those details, that helps me understand specific concerns more clearly

02/15/2022 16:51:54 PM from Noam Izenberg (Ext) to All Panelists: @Jennifer, agreed. It's a thorny problem for many reasons.

02/15/2022 16:54:00 PM from Darby Dyar (Ext) to All Panelists: The Woodlands is an expensive place to have a conference. You're right that no place is perfect wrt student safety but at least we should think about moving the conference around. Again I ask: why not move it around to make it occasionally accessible to different groups of students?

02/15/2022 16:56:18 PM from Jennifer Glass (Ext) to All Panelists: @Noam and others, thanks, yeah, I'm sensitive to this bc we were getting calls for bans on GA for AbSciCon (after the GA voting restriction law passed), but it's very

complicated bc that also deprives local (including Black-owned businesses) in ATL revenue from conference goers.....

02/15/2022 16:57:19 PM from Jennifer Glass (Ext) to All Panelists: But sounds like the LPSC location issue is outside PAC purview?

02/15/2022 16:58:04 PM from Darby Dyar (Ext) to All Panelists: No, LPSC funding come from NASA HQ. If NASA HQ decided that LPSC should move around, it would. We brought this issue up because we believe that the PAC has a voice here.

02/15/2022 16:59:03 PM from Noam Izenberg (Ext) to All Panelists: @Jennifer - I feel for that. It's very much a double edged sword. While businesses and local interests can't be ignored I believe _our_ question is what serves serves the diverse planetary community best.

02/15/2022 17:03:30 PM from Noam Izenberg (Ext) to All Panelists: I want to reinforce Darby's point. "Safety" is critical, but also a moving and qualitative target.

02/15/2022 17:03:50 PM from Conor Nixon (Ext) to All Panelists: I agree that the LPSC issue is best framed in positive terms: moving it around makes it more accessible - rather than "we want to avoid location X" which is more fraught and complex.

02/15/2022 17:04:38 PM from Serina Diniega (Ext) to All Panelists: ^agree, this is one way to mitigate many issues

**02/15/2022 17:04:44 PM from Noam Izenberg (Ext) to All Panelists: +1
Conor**

02/15/2022 17:06:28 PM from Darby Dyar (Ext) to All Panelists: IAH is the 10th busiest airport in the US.

02/15/2022 17:06:31 PM from Conor Nixon (Ext) to All Panelists: Also moving it around may help with the registration costs: if venues know that they are not the automatic choice of location, they may be more willing to negotiate on cost.

02/15/2022 17:07:37 PM from Darby Dyar (Ext) to All Panelists: Virtual meetings don't give grad students the in-person experiences that they need.

02/15/2022 17:07:51 PM from Jose Hurtado (Ext) to All Panelists: LEAG has moved around too.

02/15/2022 17:08:32 PM from Darby Dyar (Ext) to All Panelists: Walter, does JSC support PLSC in any way? Their sample collections have no bearing on where LPSC should be!

02/15/2022 17:08:35 PM from Serina Diniega (Ext) to All Panelists: ^good point. reliance on hybrid is not a silver bullet as it may just push some people to only virtual attendance being reasonable

02/15/2022 17:08:45 PM from Noam Izenberg (Ext) to All Panelists:

Shifting coast to coast means that yes, it alternately gets harder for Asia vs. Europe, but LPSC is also an American conference. That said, making it easier for Asia one year, then easier for Europe another year could actually strengthen international connections - just not simultaneously.

02/15/2022 17:09:39 PM from R. Aileen Yingst (Ext) to All Panelists: I think you could make the case that if you can't safely visit the restroom at the airport when your plane lands, that is also a case of accessibility.

02/15/2022 17:10:00 PM from Serina Diniega (Ext) to All Panelists: ^agree

02/15/2022 17:11:22 PM from Noam Izenberg (Ext) to All Panelists: Part of the point I think is that LPSC **is a unique conference.**

02/15/2022 17:11:58 PM from Serina Diniega (Ext) to All Panelists: I agree that many of the points raised (for and against) LPSC's location are very relevant, but for other conferences too, not just LPSC

02/15/2022 17:13:43 PM from Brad Thomson (Ext) to All Panelists: Specific example: LPSC conference venue refused to provide gender neutral restrooms

02/15/2022 17:15:58 PM from D'Arcy Meyer-Dombard (Ext) to All Panelists: It seems like we don't need to figure out the best conference location just now. We just need to generalize the desire to move NASA supported conferences to other venues with a positive spin towards supporting safety, accessibility, and increased networking opportunities.

02/15/2022 17:16:29 PM from Brad Thomson (Ext) to All Panelists: @D'Arcy: fully agree

02/15/2022 17:17:59 PM from Brad Thomson (Ext) to All Panelists: Thanks Justin!

02/15/2022 17:18:01 PM from Hope Ishii (Ext) to All Panelists: Thanks, Justin!

02/15/2022 17:18:09 PM from Noam Izenberg (Ext) to All Panelists: Agreed, Justin

02/15/2022 17:18:36 PM from Jennifer Glass (Ext) to All Panelists: Thanks so much Justin! excellent point! agreed

02/15/2022 17:20:05 PM from Darby Dyar (Ext) to All Panelists: Also, there was a meeting between AG chairs, the the IDEA group, and LPI people. I think there are notes?

02/15/2022 17:20:18 PM from Serina Diniega (Ext) to All Panelists: there was? I'd love to hear about that

02/15/2022 17:21:48 PM from Brad Thomson (Ext) to All Panelists: Thank you for raising that Bonnie

02/15/2022 17:21:49 PM from Serina Diniega (Ext) to All Panelists: thank you for your sharing, Bonnie

02/15/2022 17:24:01 PM from Jennifer Glass (Ext) to All Panelists: thanks very much for sharing Bonnie. I've had to have emergency medical procedures at conferences too. You make an excellent point.

02/15/2022 17:25:33 PM from Noam Izenberg (Ext) to All Panelists: Thanks Walter - VEXAG is interested in power systems including but beyond RPS that could benefit not just Venus missions but any long term/extreme environment mission.

02/15/2022 17:25:45 PM from Brad Thomson (Ext) to All Panelists: Walter's point is that the PDS4 imposition in the senior review is separate from PSD-41

02/15/2022 17:28:51 PM from Brad Thomson (Ext) to All Panelists: That was MAPSIT, but it is a MEPAG-relevant issue

02/15/2022 17:29:27 PM from Serina Diniega (Ext) to All Panelists: Is this a task for Moses Millazo?

02/15/2022 17:29:34 PM from R. Aileen Yingst (Ext) to All Panelists: Yes, still here. It's MEPAG relevant because we have decades-old missions that don't have funding to do the conversion.

02/15/2022 17:30:03 PM from Brad Thomson (Ext) to All Panelists: Speaking for the data producers (missions) would welcome the opportunity to better explain

02/15/2022 17:31:21 PM from Serina Diniega (Ext) to All Panelists: also is this an issue for going forward? i.e., not just PDS 3 -> 4 for Mars, but all those lunar and venus missions ...

02/15/2022 17:32:52 PM from Justin Hagerty (Ext) to All Panelists: Lori, you are correct about the benefit of the transition

02/15/2022 17:33:46 PM from Brad Thomson (Ext) to All Panelists: The specific issue is with ongoing missions. PDS4 conversion is costly, and there is no funding specifically for it

02/15/2022 17:34:14 PM from Serina Diniega (Ext) to All Panelists: @Brad, is there any MAPSIT concern though about precedent for the future?

02/15/2022 17:35:02 PM from Serina Diniega (Ext) to All Panelists: i.e., encourage NASA to come up with a better plan for the future, as well as deal with the present?

02/15/2022 17:35:48 PM from Jennifer Glass (Ext) to All Panelists: yes amy that sounds good

02/15/2022 17:35:55 PM from Brad Thomson (Ext) to All Panelists: Yes, that would be worthwhile to think about lifecycle costs of data

02/15/2022 17:36:56 PM from Noam Izenberg (Ext) to All Panelists: I think we need real research on the truth or not of low selection rate driving lower numbers. I have anecdotal evidence that that's the case, but only anecdotal.

02/15/2022 17:37:08 PM from Noam Izenberg (Ext) to All Panelists: If it's real, then it very much is a problem

02/15/2022 17:37:29 PM from Brad Thomson (Ext) to All Panelists: It is tough to ask a future mission to somehow anticipate and budget for a data format mandated change that may happen a decade later

02/15/2022 17:39:33 PM from Serina Diniega (Ext) to All Panelists: ^agree.

02/15/2022 17:39:38 PM from D'Arcy Meyer-Dombard (Ext) to All Panelists: I think there's a real reason to worry given the events of the last 2 years, and it would be helpful to have data directly from proposers rather than speculating.

02/15/2022 17:40:36 PM from Noam Izenberg (Ext) to All Panelists: If the reason for the drop is people simply giving up, you're not going to get that info unless you very pro-actively go after it.

02/15/2022 17:40:50 PM from D'Arcy Meyer-Dombard (Ext) to All Panelists: [This person A did not propose this year because I was busier with child care and home schooling given the pandemic]

02/15/2022 17:40:58 PM from Brad Thomson (Ext) to All Panelists: People with children under 5 (unvaxxed) are drowning

02/15/2022 17:41:57 PM from D'Arcy Meyer-Dombard (Ext) to All Panelists: ^^

02/15/2022 17:43:07 PM from Noam Izenberg (Ext) to All Panelists: You *can* potentially rule out "people don't need the money because seeing if NCEs are going up a commensurate amount.

02/15/2022 17:44:41 PM from Hope Ishii (Ext) to All Panelists: Agree. It is concerning, and going forward, we need more in-depth workforce surveys/studies, more frequently, and better demographic data.

02/15/2022 17:46:36 PM from Serina Diniega (Ext) to All Panelists: "post"

02/15/2022 17:47:25 PM from Noam Izenberg (Ext) to All Panelists: If we ever emerge from covid, and it is a major cause of the drop, then there is a distinct possibility that ROSES 22 or 23 will see that 50% come back _plus more_.

02/15/2022 17:47:59 PM from R. Aileen Yingst (Ext) to All Panelists: Thanks to everyone for giving MEPAG a forum. If you need further info from me or anyone on MEPAG, just email me at yingst@psi.edu.

02/15/2022 17:52:25 PM from Conor Nixon (Ext) to All Panelists: Do we need a finding about the question of international sample sharing?

02/15/2022 17:52:43 PM from Jennifer Glass (Ext) to All Panelists: Good question Conor

02/15/2022 17:53:03 PM from Brad Thomson (Ext) to All Panelists: Thanks colleagues! Happy to elaborate on data issues (bthom@utk.edu) as needed

02/15/2022 17:53:57 PM from Conor Nixon (Ext) to All Panelists: If so, I would recommend making non-specific to China and just making it generic about 'international cooperation on sample exchange and analysis'

02/15/2022 17:55:39 PM from Jemma Davidson (Ext) to All Panelists: On behalf of ExMAG, thank you!

02/15/2022 17:56:12 PM from Jose Hurtado (Ext) to All Panelists: Thank you everyone. Any further questions about LEAG can be sent to me (jhurtado@utep.edu) or the LEAG chair, Amy Fagan (alfagan@email.wcu.edu)

02/15/2022 17:57:39 PM from Serina Diniega (Ext) to All Panelists: I see ~6 potential findings

02/15/2022 17:57:50 PM from Hope Ishii (Ext) to All Panelists: I think we touched on everything

02/15/2022 17:58:51 PM from Dana Hurley (Ext) to All Panelists: yay!

02/15/2022 17:59:22 PM from Serina Diniega (Ext) to All Panelists: Thank you, Shoshana, for the cc and chat and all too

02/15/2022 17:59:30 PM from Hope Ishii (Ext) to All Panelists: Thanks all!

02/15/2022 17:59:35 PM from Lisa Danielson (Ext) to All Panelists: thanks!

Q&A Session for NASA Planetary Science Advisory Committee (PAC) February 2022 Meeting (Public Comment Period)

Session Number: 27606004415

Date: 2022-2-15

Starting time: 11:31

Dave Draper (Ext)(david.draper@nasa.gov) - 12:06

Q: Those of us using the browser (we have no choice at NASA) can't even see the chat box at all, fyi.

Priority: N/A-

-Stephen Rinehart (Ext) - 12:26

A: Hi Dave, hmm, I can see the chat. I joined using Chrome, if that helps at all.-

-Joel Kearns (Ext) - 12:27

A: I also can see the chat in Chrome.

-Moses Milazzo (he, him, his) (Ext)(moses@otherorb.net) - 14:22

Q: I agree with Serina. And I think that number is much, much smaller than the reality of what work is being done for free.

-Moses Milazzo (he, him, his) (Ext)(moses@otherorb.net) - 14:32

Q: There's a White Paper specifically about this topic that was submitted to the Decadal Survey.

-carmen cromartie (Ext)(cromartiereporting@gmail.com) - 14:34

Q: This is an external link to view the captions if the multimedia player is not working: <https://www.streamtext.net/player?event=NASA-PSAC>

-Moses Milazzo (he, him, his) (Ext)(moses@otherorb.net) - 14:34

Q: -

<https://baas.aas.org/pub/2021n4i493/release/1?readingCollection=7272e5bb>

Priority: N/A-

-Bradley Thomson (Ext) - 15:00

A: It is hard to read a single proposal in less than half a day (4-6 hours)

-Julie Rathbun (Ext)(rathbun@psi.edu) - 14:35

Q: In the data on demographics of proposers 2017-2020 vs 2021 it looks like Men went from 57% to 61% while women remained flat, and all the change in "No response" was due to men. Is that not significant?

-Ed Rivera-Valentin (Ext)(rivera-valentin@lpi.usra.edu) - 14:41

Q: I am glad to hear that NASA is looking into the HEC model and how it works with the community. Will there be an opportunity, either through an RFI or townhall, for the community to provide feedback?

-Moses Milazzo (he, him, his) (Ext)(moses@otherorb.net) - 14:42

Q: Could you repeat the questions? I cannot see anyone else's comments/questions.

-Moses Milazzo (he, him, his) (Ext)(moses@otherorb.net) - 14:47

Q: There was a related discussion in the PDE IRB report about making sure that sample, lab, and etc. metadata are collected in helpful ways to enable some of these cross collaborations are possible, not just in the present, but also in the far future.

-Marufa Bhuiyan (Ext)(marufa@hawaii.edu) - 14:48

Q: Would NASA be interested in Virtual Moonbase and Marsbase projects? Thanks for this amazing conference!

-Serina Diniega (Ext) - 15:00

A: we don't get the honorarium on top of payment-

-Serina Diniega (Ext) - 15:01

A: sorry, I didn't mean to type that in answer to your question-

-Marufa Bhuiyan (Ext)(marufa@hawaii.edu) - 14:52

Q: Sure

-Marufa Bhuiyan (Ext)(marufa@hawaii.edu) - 14:52

Q: I would be happy to explain

-Marufa Bhuiyan (Ext)(marufa@hawaii.edu) - 15:02

Q: Do all the attendee will get paid for attending this Planetary Advisory meeting? That might be a great example of payment and labor compensation.

-Moses Milazzo (he, him, his) (Ext)(moses@otherorb.net) - 17:01

Q: To Amy's question regarding participant safety: There are quite a few organizations who have had experience with working to make conferences/meetings safe for their attendees. For example, SACNAS, AISES, NABG, NSBE, NSBP, etc. I recommend we reach out to some of these organizations to get some help from experienced teams.

-Moses Milazzo (he, him, his) (Ext)(moses@otherorb.net) - 17:31

Q: PDS 4 gets us closer to FAIR and etc., than PDS3 does.