

NASA ADVISORY COUNCIL
SCIENCE COMMITTEE

October 18, 2019

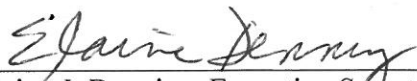
NASA Headquarters
Washington, DC

TELECONFERENCE
MEETING REPORT



January 10, 2020

Meenakshi Wadhwa, Chair



January 13, 2020

Elaine J. Denning, Executive Secretary

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Prepared by Joan M. Zimmermann
Zantech, Inc.

Opening Remarks

Ms. Elaine Denning, Executive Secretary of the Science Committee (SC), opened the teleconference and made administrative announcements. She introduced Dr. Meenakshi Wadhwa, Chair of the SC. Dr. Wadhwa greeted SC members and led introductions, and welcomed Dr. Thomas Herring who would serve as the member designee for the Earth Science Advisory Committee (ESAC) Chair.

NASA Science Overview

Science Mission Directorate (SMD) Associate Administrator, Dr. Thomas Zurbuchen, provided an update on pertinent issues for the SC. The number of SMD missions changes almost weekly, and includes Earth science airborne investigations, the continuing Astrophysics Division (APD) Stratospheric Observatory for Infrared Astronomy (SOFIA), numerous satellite missions, and the sounding rocket and balloon programs. SMD research grants are funding approximately 10,000 scientists around the country.

Recent additions to the Small Explorers program include the Heliophysics Division (HPD) missions Polarimeter to Unify the Corona and Heliosphere (PUNCH) and Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites (TRACERS). In the Earth Science Division (ESD), the Geosynchronous Littoral Imaging and Monitoring Radiometer (GLIMR) is one of the newest selections in the Venture Class Instrument (EVI) category.

SMD held a retreat during which several new staff members have been introduced: Karen Flynn as Deputy Associate Administrator (DAA) for Management, who is replacing Roy Maizel, who has retired. Dr. Zurbuchen announced that Dr. Nicky Fox has been selected as HPD Director, and Dr. Lori Glaze has been appointed officially as Director of the Planetary Science Division (PSD). Ms. Joan Salute (PSD) and Ms. Jeanne Davis (APD) are serving as Associate Directors for Flight.

The Ionospheric Connection Explorer (ICON) is now a space-based mission, having finally launched from a Pegasus XL rocket. The mission is going well thus far and the entire heliophysics community is pleased with it. ICON is studying the physics of the upper ionosphere. The Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer (OSIRIS-REx) is progressing in its investigation of the carbonaceous asteroid, Bennu, and still is contemplating four potential sample sites, selected in August of this year, for touch-and-go sample collection maneuvers. The mission is breaking many records in small body exploration. In Earth science, small satellite missions provided very useful rainfall data during the 2019 storm season, demonstrating in many cases that these observations can be done on a small scale. A small satellite that uses Global Positioning Satellite (GPS) reflectors to collect signals from the ocean has been providing research data, which is also being made available to forecasters. Asked about signal latency, Dr. Zurbuchen noted that this was not a forecasting mission, but a research mission, and is being used as a means of proving the utility of the reflected GPS signals. The latency is between one and three days.

The Mars 2020 rover is making incredible progress and will carry impressive technologies. Mars 2020 just underwent a new cost analysis, and has been rated Green on all parameters, save for cost. It is certain that lessons learned will emerge from this mission to see what NASA can do better in the future in terms of cost. Europa Clipper has been confirmed and could launch as early as 2023. Clipper will carry many instruments and has been the subject of strong National Academy of Sciences (NAS) guidance, specifically to keep the mission within cost guidelines. NASA is closely following Europa Clipper's Principal Investigators (PIs) to keep the scope and cost of the mission in-guide. The Space Launch System (SLS) also is making progress, and will make solar system traverse much faster.

Dragonfly is a newly selected mission that will travel to the Saturnian moon, Titan, using an interesting new investigative approach, an "octocopter" that will fly through the moon's atmosphere.

Dr. Zurbuchen reported having met with the Deputy Administrator during the previous week and visited the James Webb Space Telescope (JWST), in many ways the most difficult mission that NASA has undertaken. JWST is meeting its milestones, and has completed a third expansion test of the spacecraft's sunshield; the mission does have two or three technical issues that are being chased down. There are many other issues to discuss pertaining to JWST, including leadership, management and politics. Dr. Vinton Cerf raised some questions about testing JWST's mechanisms in the absence of gravity. Dr. Zurbuchen said that JWST is being tested extensively with these complex constraints in mind, particularly with regard to deploying the telescope's sunshield. Dr. Wadhwa asked for some elaboration of the technical issues. Dr. Zurbuchen described the first as the difficulty of unfolding the sunshield and testing any modifications end-to-end; under certain circumstances, some threads could catch during the testing. The second concerned a device that amplifies microwave energy (called the "traveling-wave tube amplifier" or TWTA); one of them has had a failure, but it is believed that the root cause is now understood. There also is a command processor that bears some watching. These were the three top JWST technical areas on Dr. Zurbuchen's radar. He emphasized that these were not specific mistakes, but areas of potential concern. Asked if there any potential causes for delays, Dr. Zurbuchen said he worried about it every day. However, he emphasized that Greg Robinson and the mission team have done a tremendous job at Goddard Space Flight Center and at Northrop Grumman.

Under a new small spacecraft program, Small Innovative Missions for Planetary Exploration (SIMPLEx), SMD is supporting investigations which are thought of as relatively high-risk. Three recent selections include Janus, which will study the formation of small "rubble pile" asteroids and build a model of a binary asteroid system. The next is Escape and Plasma Acceleration and Dynamics Explorers (EscaPADE), which is designed to characterize the processes underlying Mars' escaping atmosphere, as well as how the atmosphere responds to the constant outflow of the solar wind. The third selection is Lunar Trailblazer, which will detect and map water on the lunar surface to determine how its form, abundance, and location relate to lunar geology. If successfully developed, these SIMPLEx launches will carry other payloads as well.

The Human Exploration and Operations Mission Directorate (HEOMD) campaign to put humans on the lunar surface as early as 2024, and eventually on the surface of Mars, includes some science elements that will participate through the Commercial Lunar Payload Services (CLPS). SMD is starting to develop some science projects for this program, and also is taking part in a lunar cargo lander project. Mr. Steve Clarke noted that CLPS is on track to deliver in July 2021. He added that the work is going well, and that working with commercial partners has been enlightening. Instruments are being developed, and NASA is about to conclude a first on-ramp activity for CLPS focused on developing a future, enhanced landing capability for bringing larger payloads to the Moon. NASA also is developing a 300-kg rover with four instruments on board, an effort that is leveraging numerous past studies. There will be an independent review on the rover later this month, which then will be briefed out to Dr. Zurbuchen. Launch is scheduled for 2022. Dr. Herring asked what the commercial sector is getting out of this. Mr. Clarke said that many CLPS participants have been around for a while, and do have a customer base as well as venture capital (VC) support. Some companies want to send video cameras to record the lunar traverse, others have experimental technology payloads for in-situ resource utilization (ISRU), a subject of great interest to NASA, and some want to re-explore Apollo sites. NASA is only beginning to learn about the companies' other customers. The CLPS contractor Astrobotics, for instance, will be flying a Japanese payload along with its NASA project.

Dr. Zurbuchen said that he was eagerly awaiting final Congressional markup action on NASA's latest budget submission. Mars Sample Return (MSR) is heavily on NASA's mind, even though the program has not yet officially started. MSR will include a sample-retrieving rover, sample containment systems, an Earth-return orbiter, and will need access to a sample return facility on Earth. The House and Senate Appropriations Committee markups are generally positive for NASA Science, but in different areas. SMD

will have to make some choices, inevitably, based on the final disposition of the budget. Dr. Zurbuchen was grateful for the various stakeholders on the Hill who have provided support on the budget process.

Dr. Zurbuchen addressed a recent revivification of planetary protection at NASA. The Planetary Protection Independent Review Board (PPIRB) was stood up in June 2019, on the recommendation of NAS and responding to an action of the NASA Advisory Council (NAC) to properly address the subject. The community recognizes that planetary protection science has changed, as have the stakeholders. Dr. Alan Stern, PI for the New Horizons mission, heads the PPIRB. Dr. Stern has both the science and entrepreneurial background appropriate for the task. The new independent review board will look at the planetary protection classification of bodies, and “special regions” on bodies. Another independent review board has been stood up to examine the International Space Station (ISS) and its utility to human exploration, to assess NASA’s agreement with the Center for the Advancement of Science in Space (CASIS), and to focus on topics such as commercialization of low-Earth orbit (LEO). It is a good time to look at this, given mission challenges and opportunities in commercialization. The Chair is Dr. Elizabeth “Betsy” Cantwell, and SMD’s Executive Officer, Ellen Gertsen, is the Review Manager. Findings of both independent review boards will be presented to the NAC and the SC when complete.

Dr. Wadhwa opened the floor for questions. Dr. Cerf thanked Dr. Zurbuchen for a crisp and useful presentation. Dr. Herring asked about the time scale of MSR. Dr. Zurbuchen said that based on a proposal on the Hill, MSR could launch as early as 2026, and samples could be back at Earth in 2030-2031. Dr. Wadhwa added her appreciation, while touching briefly on the cost overruns on Mars 2020 and JWST, and expressed her appreciation for Dr. Zurbuchen’s energy and commitment.

Goals of the Meeting

Dr. Wadhwa reviewed meeting goals, chiefly to cover responses to topics that came up at the last SC meeting in May, and then to discuss future topics for the Fall meeting.

Advice Outcomes

Ms. Denning reviewed some findings and recommendations from the previous SC meeting, and introduced several short briefings on the SMD responses.

Science Strategy on the Moon

Mr. Steve Clarke addressed the committee’s findings on NASA’s Science Strategy on the Moon document. Much of the SC commentary, edits, and new introductory material have been incorporated into the draft document. The Science Strategy on the Moon is based on the work of the International Space Exploration Coordination Group (ISECG), a number of reports from the National Academies, and discussions with HEOMD. The draft is complete almost in terms of revision, and will be being treated more as a “living document” as NASA continues to acquire data from orbital assets around the Moon. Mr. Clarke said he would provide as much information as he could at the next SC meeting, including what NASA has received in terms of the community input.

NASA Science Plan

Ms. Ellen Gertsen reported that SMD updated the NASA Science Plan with comments from both the SC and the NAS Space Studies Board, and has sent the document back to the NAS. The intent is to finalize the NASA Science Plan by early 2020.

Science and Technology Definition Teams

Dr. Jared Leisner reported that NASA has completed the process of implementing an SC finding on how to carry out Science and Technology Definition Team (STDT) deliberations; the process had recently been altered to follow Federal Advisory Committee Act (FACA) rules. The first such STDT held under these rules, the Geospace Dynamics Constellation (GDC), has been completed. NASA has taken the

finding to heart, while noting one positive impact of the FACA process, in that by removing implementation details, the team was much more focused on the science aspect of the mission concept. Dr. Leisner noted that because of that limitation, the GDC STDT report is a much better science document. In the future, however, due to other limitations that arose during the GDC team process, NASA will be using established contracting methods to hold STDTs in non-FACA meetings. Henceforth, STDTs will report out their findings and will not go through the advisory committees. In response to some questions on the change, Ms. Denning explained that overall, it was deemed that most SMD mission STDTs do not need FACA rules because the community is broad, and that established contracting methods (ECM) have been proven. The FACA experiment was only of two years' duration. The change back took effect as of June 12, 2019 when the new division advisory committee charters were renewed.

Diverse Teams and Safe Environments

Ms. Gertsen briefed the SC on NASA's response to a finding on the still-developing diversity plan for SMD that seeks to communicate priorities in a number of areas, including altering grant terms and conditions for NASA-funded research, particularly with how these deal with PIs accused of harassment. SMD is going through comments now, and will finalize an updated document shortly. Next, to be adopted with the Discovery and New Frontiers programs, will be the inclusion of language on career development, meant to encourage awarded PIs to think about the robustness of their mission teams, given that some planetary missions, particularly to the outer planets and beyond, have very long lifetimes. NASA is also investigating ways to encourage next-generation PIs, a long-term effort that Dr. Michael New and Ms. Gertsen have been working on. There will be a workshop on this subject at the University of Arizona next month, and there also will be a presence at the next American Geophysical Union (AGU) meeting.

Dr. New also is leading an effort to identify ways to reduce bias in proposal evaluations, based on some successful work in the astrophysics community that used dual-anonymous evaluation techniques to select proposals. This technique has been used to assess proposals for the Hubble Space Telescope's (HST) Guest Observer (GO) program and is being expanded to other programs. NASA is also working to more broadly to expand standards and codes of conduct to facilitate inclusivity; there are some mission teams that already have established such codes.

In response to a question, Ms. Gertsen said that NASA intends to offer its "next-gen" PI workshop twice a year, moving it around to alternate locations, and will continue to refine the contents based on response to the first workshop.

Dr. Wadhwa expressed appreciation for the thoughtful responses of all the speakers. Dr. Cerf commented that one of the problems related to encouraging diversity is that it is not easy to impose target statistics on small populations. Secondly, it is hard to establish a static profile; it is better to look at how populations are changing over a period of two or three years. He felt that NASA should not impose quotas that do not serve the organization well, and to be careful to satisfy the needs of the organization. Ms. Gertsen said that NASA definitely wants to avoid quotas, but does want to create opportunities for people who want to get involved in the research community, and create safer environments for participants. Dr. Cerf agreed that it is very important to create a nontoxic atmosphere, and that doing so dovetails naturally with the fundamental issues of diversity and inclusion. Ms. Denning credited Dr. New with recognizing that diverse teams and safe environments go together.

Priority Topics for Fall Meeting

Research and Analysis Innovations

Dr. New, Deputy Associate Administrator for SMD Research, discussed several research and analysis (R&A) innovations being pursued by SMD. First, there is the effort that Ellen Gertsen mentioned to encourage new PIs, such as through the upcoming PI workshop. Potential participants were required to be

either new to the program or not have been a PI for five years, and these individuals had to apply and be selected for the workshop. Second, SMD will be applying the dual anonymous approach developed for Hubble competitions by the Space Telescope Science Institute (STScI) to all astrophysics GO programs. Proposer access to facilities, field sites, etc. will need to be written in an anonymized way. Third, the dual anonymous approach will be applied for peer review programs of the four divisions: Habitable Worlds, Heliophysics Guest Investigators, the Earth Science New Investigator Program, and astrophysics data analysis. SMD will provide more detailed descriptions on how to write anonymized proposals. Lastly, a fourth pilot study will assess how R&A handles intellectual risk evaluations (high-impact, high-risk research; HR/HI), or in other words, “reputational” risk. SMD will start a new process that will re-examine some HR/HI proposals that were not previously selected, and select some. Dr. Herring asked how SMD could specifically encourage HR/HI research proposals. Dr. New said he was hoping to publicize the issue more widely, and also intended to ask proposers to include a statement as to why they think their proposal is HR/HI, then see if the panel agrees with the argument. Some of these proposals will not be selected through the usual channels; it is foreseeable that some will be given mediocre scores. Each discipline division will be required to select three proposals that meet these HR/HI criteria; the hope is that these selections will demonstrate to the community that NASA is indeed accepting such proposals, thereby encouraging more. Dr. Feryal Ozel commented that she appreciated the initiative, but noted that as there will be areas wherein a significant part of the proposal is based on past research, it will be difficult for some proposers to remain anonymous. Dr. New said he would like to talk further about why she thought the process would depend so heavily on certain people.

Assessment of Science Activation

Ms. Denning previewed another major topic for the SC Fall meeting. At past SC meetings, there had been presentations and discussions on an educational effort, the NASA SMD Science Activation Program. The program began in 2016 to help NASA converge on efficient and effective utilization of the SMD science experience and to engage with students of all ages, including lifelong learners. A NAS report assessing the Science Activation Program will be released on November 7, in time for the SC to be able to hear a presentation by the study chair Dr. Margaret Honey, comment, and advise.

Public Comment

There were no comments.

Discussion

Dr. Wadhwa encouraged SC members to comment on the day’s proceedings. Dr. Cerf wondered if there were any NASA efforts focused on very long-term space technologies, such as interstellar communication from targets as distant as Alpha Centauri (which is light-year distances away); getting a spacecraft to such a star would take hundreds of years. Dr. Wadhwa knew of the privately-funded Starshot effort that has no affiliation with NASA. Dr. New said that HPD has been leading an effort on interstellar probes, akin to the Voyager probes. Ms. Denning noted that the SC could entertain a lunch talk or briefing on such topics at its next meeting. Dr. Cerf offered to distribute a related Lincoln Laboratories report, and thought a mission beyond the Oort Cloud also might make for an interesting discussion.

Dr. Wadhwa said that there were some reports from the NAS and the Space Studies Board that could be of interest to the SC that could be distributed. Ms. Denning said she was collecting these reports in preparation for a SC discussion. Dr. Verbiscer said she would like to hear about progress on the proposed Near-Earth Object infrared survey project announced at the last Planetary Science Advisory Committee (PAC) meeting. Dr. Herring requested a discussion on the balance of the programs (e.g., Earth science, planetary science) within SMD.

Dr. Wadhwa thanked SC members for their participation and inputs, and closed the meeting at 2:56pm.

Appendix A Attendees

Science Committee Members

Meenakshi Wadhwa, Arizona State University, *Chair, Science Committee*
Vinton Cerf, Google
Thomas Herring, MIT (*ESAC Chair designee*)
Michelle Larson, Adler Planetarium
Mike Liemohn, University of Michigan
Feryal Ozel, University of Arizona
Pat Patterson, NASA Advisory Council
Anne Verbiscer, University of Virginia
Elaine Denning, NASA Headquarters, *Executive Secretary, Science Committee*

Teleconference Participants

Max Bernstein, NASA HQ
Linda Billings, NIA
Veronica Bindi, NASA HQ
Dana Bolles, NASA HQ
Maddy Bronstein, ULA

Lin Chambers, NASA SMD
Greg Dell, NASA
Ellen Espenschied, NASA
Phillip Harman, UCDC
Brian Harvey
Hashima Hasan, NASA HQ
Grey Hautaluoma, NASA
Michael Henry, NASA
Grace Hu, OMB
Doug Isbell, NASA JPL
Jennifer Kearns, NASA SMD
Gilbert Kirkham, NASA
Theodore Kronmiller, Kronmiller Law Offices
Rob Landis, NASA HQ
Lily Larson, Ball Aerospace
Amanda Moore, NASA
Kevin Murphy, NASA
Michael New, NASA HQ
Sarah Noble, NASA HQ

Marian Norris, NASA HQ
Charles Norton, NASA HQ
John Rummel, ECU
Maria Santos, NASA SMD
Andrew Schurr, NASA HQ
Emily Sylak-Glassman, NASA
Florence Tan, NASA
Paul Voosen, AAAS
Joan Zimmermann, Zantech, Inc.

Appendix B SC Membership

Dr. Meenakshi Wadhwa (Chair)
Arizona State University

Dr. Vinton Cerf
Google, Inc.

Dr. Jeffrey Hoffman
Massachusetts Institute of Technology

Dr. Michelle Larson
Adler Planetarium

Dr. Michael Liemohn
University of Michigan

Dr. Feryal Ozel
University of Arizona

Dr. Pat Patterson
Space Dynamics Laboratory

Dr. Anne Verbiscer
University of Virginia

Mr. Marc Weiser
RPM Ventures

Ms. Elaine Denning (Executive Secretary)
NASA Headquarters

Appendix C Agenda



Dial-In (audio) & WebEx (view presentations online) information is located at the bottom of the page.

▲ NASA Advisory Council Science Committee

**Telecon Meeting
October 18, 2019
1:00 – 3:00 p.m.**

Agenda (Eastern Time)

Friday, October 18

1:00 – 1:10	Opening Remarks / Introduction of Members	Ms. Elaine Denning Dr. Meenakshi Wadhwa
1:10 – 1:50	NASA Science Overview	Dr. Thomas Zurbuchen Mr. Steven Clarke
1:50 – 1:55	Goals of the Meeting	Dr. Meenakshi Wadhwa
1:55 – 2:15	Advice Outcomes Science Strategy on the Moon NASA Science Plan Science and Technology Definition Teams Diverse Teams and Safe Environments	Ms. Elaine Denning Mr. Steven Clarke Ms. Ellen Gertsen Dr. Jared Leisner Ms. Ellen Gertsen
2:15 – 2:25	Priority Topics for Fall Meeting Research and Analysis Innovations Assessment of Science Activation	Dr. Michael New Ms. Elaine Denning
2:25 – 2:30	Public Comments	
2:30 – 3:00	Discussion	All
3:00	<i>Adjourn</i>	

Dial-In and WebEx Information

Dial-In (audio): Dial the USA toll free number 1-888-469-1762 or toll number 1-212-287-1653 and then enter the numeric participant passcode: 8281293. You must use a touch-tone phone to participate in this meeting.

WebEx (view presentations online): The web link is <https://nasaenterprise.webex.com>, the meeting number is 904 615 112, and the password is SC@Oct2019 (case sensitive).

** All times are Eastern Time **

Appendix D Presentations

1. NASA Science Overview: Explore Science; *Thomas Zurbuchen*
2. Goals of the Meeting; *Meenakshi Wadhwa*
3. Response to NAC Science Committee Advice; *Elaine Denning, Steven Clarke, Ellen Gertsen and Jared Leisner*