EXPLORE
SOLAR SYSTEM & BEYOND

Lori S. Glaze, Ph.D.
NASA Planetary Science Division Director

LPSC NASA Townhall
March 18, 2021
FY21 Appropriations Highlights

• FY 2021 Consolidated Appropriations Act signed into law December 27, 2020
• Continued strong support for Science with a $7.3B budget
  • $994M above the FY21 President’s Budget request
  • $162M above the FY20 enacted level

Planetary Science

• $40M above the FY21 request
• Funding to support decadal priorities such a Mars Sample Return mission, Europa Clipper
• Additional funds for Planetary Defense, supporting DART and Near-Earth Object Surveillance Mission
• Additional funding for New Frontiers/Dragonfly
• Strong support for Lunar Discovery and Exploration, as well as Commercial Lunar Payload Services
• Europa Clipper given permission to use CLV in the event SLS is not available or incompatible

<table>
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<tr>
<th>($M)</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>FY19</th>
<th>FY20</th>
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Mars2020 / Perseverance

- Landed successfully in Jezero Crater, February 18
  - Touchdown site informally named after Octavia E. Butler
  - Watched by > 4 million on live event broadcast and >20 million views on YouTube
- Rover check out and calibration activities are ongoing
  - First drive was on March 4, moving 6.5 m and lasting about 30 minutes

Map: Stack et al. 2020/M2020 Science Team
• Final flyby of Bennu: April 7, 2021
  • Will image sample collection site, Nightingale, to look for surface transformations (mimicking a 2019 observation sequence)
  • Will image Bennu for a full 4.3-hr rotation to obtain high-resolution images of the northern and southern hemisphere and its equatorial region

• Headed back to Earth: May 10, 2021

• Arrives Earth: September 2023
Lucy

- First mission to the Trojan asteroids:
  - 12 years, 7 flybys, one spacecraft
  - ATLO progressing well
  - Pre-Environmental Review completed – spacecraft moved to environmental test lab
  - All spacecraft components, including solar arrays and high-gain antenna, now installed
  - Launch and Asteroid Encounter Systems Verification Tests performed successfully
- Due to ship to Cape Canaveral late July
- Launch window opens October 2021; first Trojan flyby August 2027
Double Asteroid Redirection Test

- Risk assessment was performed on DART project schedule to determine viability of primary and secondary launch periods
  - Technical challenges associated with DRACO imager and solar arrays
  - SMD has directed DART project to pursue secondary launch window (November 24, 2021 to February 15, 2022)
  - Project is working with SpaceX and NASA’s Launch Services Program to identify earliest possible launch opportunity within this window
  - DART will arrive at Didymos binary asteroid system within a few days of the originally scheduled impact date (September 30, 2022)
- Integration and Test activities are ongoing
- LICIACube manufacturing, integration, and test has started; on track for delivery May 2021
**Community**

**SMD Strategy:** seek to foster a community where everyone feels welcome, included, and valued

**SMD Goals:** Develop a workforce and scientific community that reflects the diversity of the country and to instill a culture of inclusion across the portfolio

**Community Initiatives:**

- NASEM study on Increasing Diversity and Inclusion in the Leadership of Competed Space Missions
- PSD pilot study for early-career scientists to observe Psyche, Europa Clipper, and Dragonfly science team meetings
  - Lessons learned being considered before continuing the program
- Next PI Launchpad: **June 14–25, 2021**
  - Virtual over two weeks: 1 week of asynchronous content, 1 week interactive (2 to 3 hours per day)
  - Deadline for applications: March 22
Dr. Stephen Rinehart
Director, Planetary Research Programs

LPSC NASA Townhall
March 18, 2021
LPSC Happenings

“Meet your Program Officer” events during the breaks each day

• Get there through the Networking Lounge

• The “Meet and greets” are intended to be an informal way for folks to get a chance to meet and talk to HQ Program Officers. Stop in, say hello!
Updates on ROSES 21

• ROSES21 is out now!
  • Dual-Anonymous Peer Review for all Data Analysis Programs (DAPs)
  • No Due Date (NoDD) programs (open now!)
    • [https://science.nasa.gov/researchers/NoDD](https://science.nasa.gov/researchers/NoDD)

• Duplicate proposals
  • No proposal can be submitted to more than one program in the same ROSES year; nor may it be submitted if it is currently under consideration by another program covered by C.1
  • For NoDD programs: No proposal can be submitted to any NoDD program if it was previously submitted within the past year (12 months)
COVID Augmentations

• We are still receiving additional augmentation requests.
  • A significant number of requests are not eligible, mostly due to large uncosted numbers.
  • Eligible, highest-priority requests have been approved
  • Additional requests received on March 5, in evaluation now.

Sidebar on Uncosted

What do these terms mean?
• Committed: we have a plan to spend it (set aside $XX to buy Widget) – but we can still change our mind.
• Obligated: we are spending it (we placed a purchase order for Widget)
• Costed: we spent it (the Widget was received, and we paid the bill)
DAPR

Habitable Worlds proposals are in and we’ve started the review process. Some notes:

• Several proposals were returned without review because of egregious violations of DAPR protocols

• Numerous other DAPR non-compliances were observed; PIs will be “warned”, but the proposals will continue through review this year (next year, though….). Most common issues:
  • Failure to follow the reference numbering scheme laid out for DAPR
  • Accidental inclusion of names (inconsistently): (e.g. in one place in the proposal, it says “Co-I XX”, while elsewhere it says “A co-I” or similar).
Compliance and Reporting

• Compliance: We have new and better tools for automatic (administrative) compliance checking (e.g. margins, font size). These have dramatically improved our ability to identify non-compliant proposals.
  • All compliance issues are verified by a Program Officer (PO)
  • Non-compliant proposals may be returned without review

• We are looking for ways to ensure that data are properly archived and that papers get into PubSpace, even after a grant ends
  • This a requirement for all NASA grants
  • This is being worked at the SMD level
EXPLORE
MARS SAMPLE RETURN

Jeff Gramling
Director, Mars Sample Return Program

LPSC

March 18, 2021
Perseverance landing, 2/18
Capable of selecting and caching 43 samples
• The last two Decadal Surveys, and the most recent mid-term, all have shown strong support for Mars Sample Return, with Mars2020 as the highest priority in Visions and Voyages
  • First “round-trip” to another planet, paving the way for future human exploration
  • The first billion years and life’s beginning in the Solar System- the record is on Mars
    • The oldest known life on Earth existed ~3.5 billion years ago, a time when Mars was habitable
    • Today, <<1% of the Earth’s surface is 3 billion years or older, >50% of the Mars’ surface is 3 billion years or older
• MSR is a complex mission that is possible today because of a strong international partnership with ESA and the $10+B investment made through the formulation, technology and operational projects of the past decades
  • In recognition of the size, complexity, and technological and engineering advances required, MSR employed several processes much earlier in Pre-Phase A
    • Commissioned two Independent Cost/Schedule Estimates
    • Had an Independent Review Board (IRB) conduct a two-month examination of the program
    • Established the program’s Standing Review Board to conduct the MCR as an Agency review

**MSR was approved to proceed into Phase A in December**
**Perseverance has landed**
Overview of Green Pathways Across Jezero-Midway Region

• SRL will carry enough propellant to fly out the backshell separation ellipse (8 x 8 km) and land at a specific spot (~±20m accuracy)

• Enables new capability of landing at a specific site pre-scouted from the Mars surface
Diversity of Samples

Inside the Jezero system (20 samples)

- Mafic Floor
- Olivine/Carbonate-Bearing Floor
- Distal Delta/Lake Deposits (Var. compositions)
- Jezero Regolith
- Point Bar Unit Deposits (Olivine/Carbonate/Silica)
- Inverted Channel Deposits (LCP/Clay-bearing)
- Marginal Lake Deposits
- Blanks

Outside the Jezero system (17 samples; extended mission, if any)

- Jezero Crater Rim
- Megabreccia Inc. Kaolinite Block (Jezero Rim)
- Capping Unit (Jezero Rim)
- Jezero Regolith
- Point Bar Unit Deposits (Olivine/Carbonate/Silica)
- Inverted Channel Deposits (LCP/Clay-bearing)
- Marginal Lake Deposits
- Blanks

- Basement Ridges
- Layered Basin-Filling Unit
- Capping Unit (Midway Ellipse)
- Blanks

Adapted from Ken Farley (CAPS, 2019)
EXPLORE
with us
ESSIO Organization Chart

Dr. Joel Kearns
Deputy Associate Administrator for Exploration

Associate DAAX (Vacant)

Program Executives
- Jay Jenkins
- Angela Melito
- Dr. Zachary Pirtle

Program Scientists
- Dr. Brad Bailey
- Dr. Debra Needham
- Dr. Sarah Noble*
- Dr. Ryan Watkins

PSD
- PESTO (NPLP & DALI):
  - Ryan Stephan
- PMPO (LRO & LSITP)

JSC
- CLPS Office:
  - Chris Culbert

Resource Analyst: Renee Leck
Office Support: Mackenzie Howard
Admin. Assistant: Wendy Tuttle

*Joint ESSIO/PSD
Lunar Surface Science Workshop (LSSW) Update

The ninth installment of the LSSW will feature discussions on “Progress and Challenges,” including updates from NASA HQ and the Artemis Program.

Specific topics will include:
- HQ Division updates
- General structure of HQ
- Artemis progress and updates

April 29, 2021
LUNAR SURFACE Science Workshop
https://lunarscience.arc.nasa.gov/lssw/
Human Exploration Planning and Progress

JACOB BLEACHER
Chief Exploration Scientist
Human Exploration Operations Mission Directorate
Lunar & Planetary Science Conference
NASA Night
3/18/21
Artemis Snapshot

- SLS
- Commercial Lunar Payload Services
- The Gateway in Lunar Orbit
- Orion
- First Woman and Next Man to the Moon
- Artemis Base Camp
Gateway Status

**OCT 2020**
- Habitation and Logistics Outpost (HALO) Preliminary Design Review (PDR) Kick-Off
- Memorandum of Understanding (MOU) with the European Space Agency (ESA) signed

**NOV 2020**
- Maxar-led Power and Propulsion Element (PPE) Delta System Requirements and System Definition Reviews completed
- MOU with the Canadian Space Agency (CSA) signed

**DEC 2020**
- European System Providing Refueling, Infrastructure and Telecommunications (ESPRIT) contract awarded by ESA to Thales Alenia Space (France)
- Canadarm3 contract awarded by CSA to MDA
- MOU with the Japan Aerospace Exploration Agency (JAXA) signed

**FEB 2021**
- PPE/HALO Launch Vehicle contract award

**MAR 2021**
- Gateway Program Sync Review
- HALO PDR Close-out

**APR 2021**
- HALO final contract award (fixed price)
- Gateway Program Key Decision Point 0
Early Gateway Science Payloads – International Endeavor

• NASA’s space weather instrument suite, Heliophysics Environmental and Radiation Measurement Experiment Suite (HERMES), will monitor solar particles and solar wind.

• ESA’s radiation investigation, the European Radiation Sensors Array (ERSA) will help provide an understanding of how to keep astronauts safe by monitoring the radiation exposure in Gateway’s unique orbit.

Remote Gateway operations and research will continue when uncrewed
Three contracts awarded April 30, 2020

Complete lander systems were proposed including launch vehicles for an end-to-end solution

Base Period: May 2020 – February 2021*

*Base Period extended to April 30, 2021

The Broad Agency Announcement catalyzed the innovation in U.S. Industry it was designed to do.
Human Research for Risk Reduction in SUSTAINABLE HUMAN EXPLORATION

International Space Station (ISS)
Notional Commercial Platform in Low-Earth Orbit

Low-Earth Orbit (LEO) Platforms: Analogs and technology demonstrations for transit to Mars and crew performance after landing

Gateway
Integrated Missions with stays on the Gateway and activities on the lunar surface serve as analogs for crew health and performance on missions to Mars.

Mars-class Transportation

Successful Mars transit and surface missions will build on knowledge gained through analogs and research on all previous platforms

Earth: Simulated habitats and operations analogs

Lunar Surface: Human experience of greater deep space hazards

Mars missions will require advancements in how we mitigate the effects of all 5 hazards of human spaceflight:

- Isolation & Confinement
- Distance from Earth
- Changes in Gravity
- Radiation
- Hostile Closed Environments