

National Aeronautics and  
Space Administration



# EXPLORE SOLAR SYSTEM & BEYOND

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NASA Planetary Science Division Director

CAPS Meeting  
September 16, 2020





# COVID-19





# COVID and PSD

## Current top priorities

- Everyone's health and safety
- Protecting hardware and integrity of data for operating missions
- Continued work on DART and Lucy

## Ongoing challenges

- Full-time telework; learning how to successfully conduct our work in a virtual environment
- Balancing work and other responsibilities
- Building and nurturing relationships with the community and our teams—especially with new colleagues

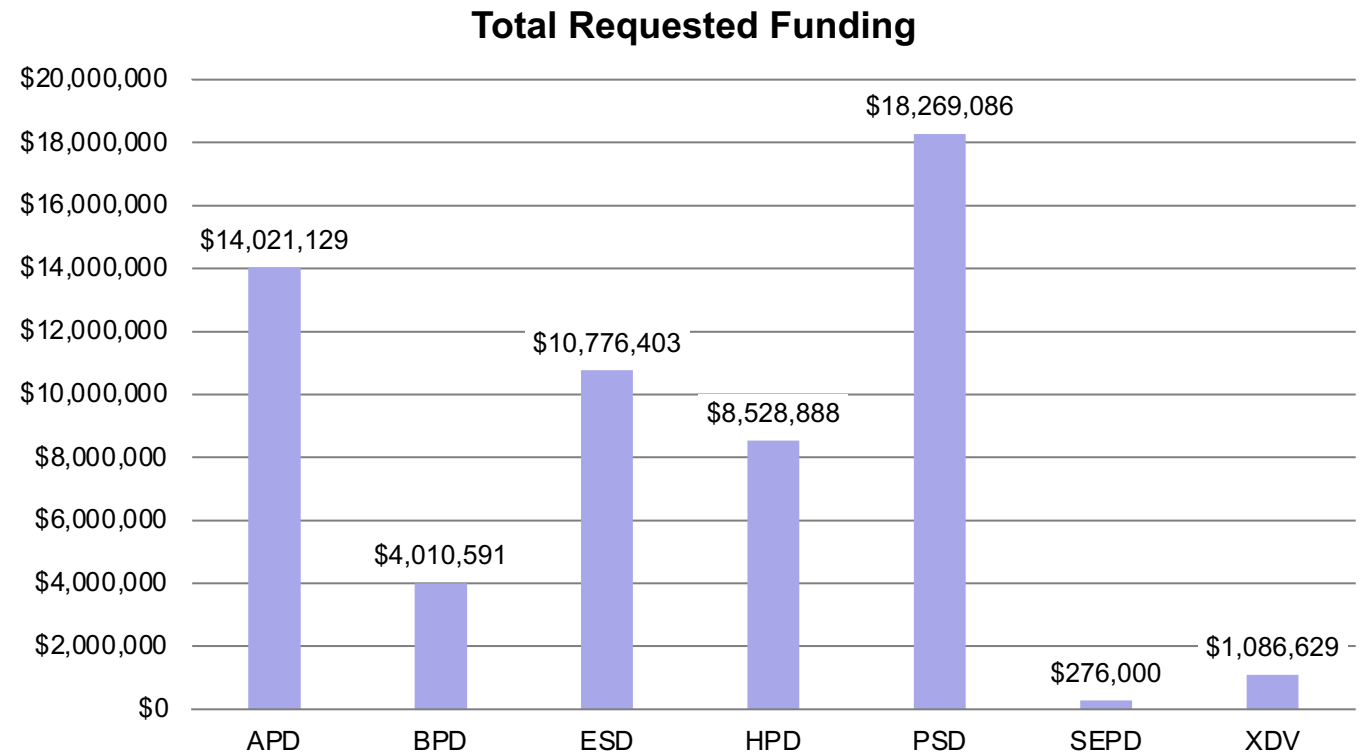
# R&A Grant Extensions

- SMD does not want the COVID-19 epidemic to derail the careers of future leaders; we continue to focus on mitigating the impacts of the epidemic
- Pursuing a three-pronged strategy for early career researchers
  - SPD-36: Current grantees may request funded extensions starting on October 1, 2020
    - Highest priority for funding is to support graduate students and postdocs
    - Next highest priority is for funding to support soft-money, early-career researchers
  - Temporary expansion of the NASA Postdoctoral Program (NPP) to more than the 124 Fellows funded by HQ
    - Size of expansion to be no more than 50%, but still under discussion as we learn more
  - Working with Centers to support/fund additional term CS hires focused on additional training and career growth (2–6 years)
- Since all three of these actions must be funded from the R&A Program, size of commitment for all three is expected to be approximately 15% of funding available for new awards
- Expressions of Interest in Augmentations and Funded Extensions requested to bound size of potential commitment



# Results of Call for “Expressions of Interest”

- We received over 400 Expressions of Interest!
- Highly unequal distribution across the different divisions
- Mean request was \$133,104
- Total request was ~\$57M
- SMD expects ~\$28M available
- SMD is considering how this will impact our plans





# Community Initiatives

- Statement of Task sent to Space Studies Board of NASEM to address topic of increasing diversity and inclusion in the leadership of competed space missions
- Psyche, Europa Clipper and Dragonfly are providing the opportunity for early-career scientists to observe their next science team meetings
- In-person PI Launchpad events suspended:
  - Investigating options for virtual workshops tied to upcoming conferences
  - Information and materials from first event available: <https://science.nasa.gov/researchers/pi-launchpad>

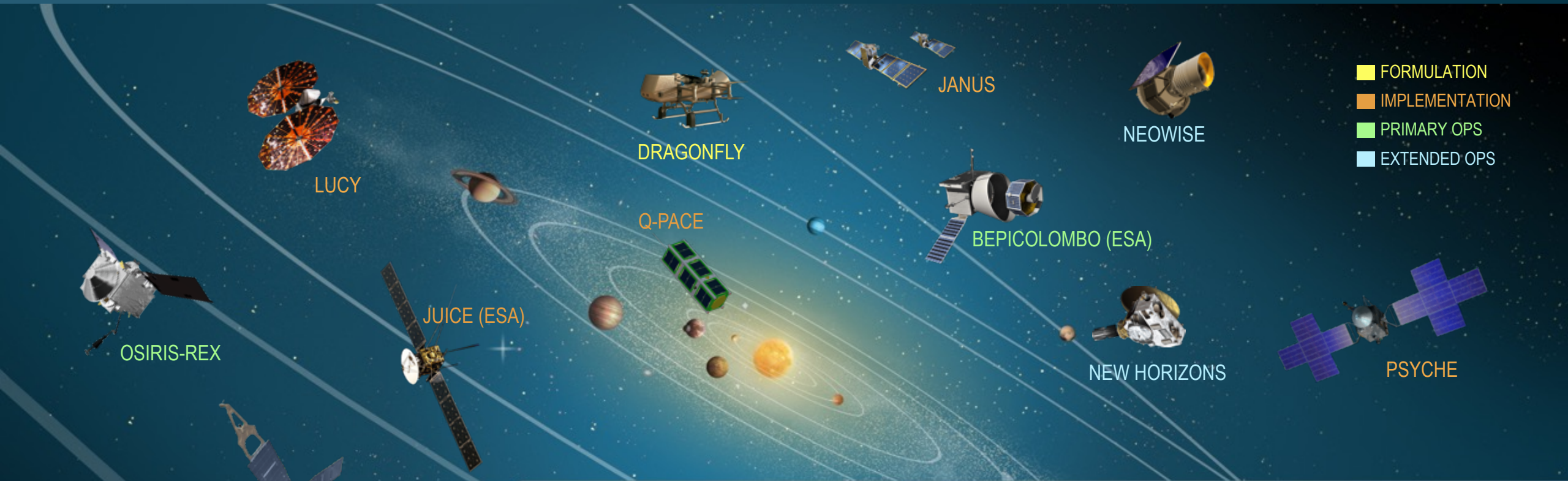




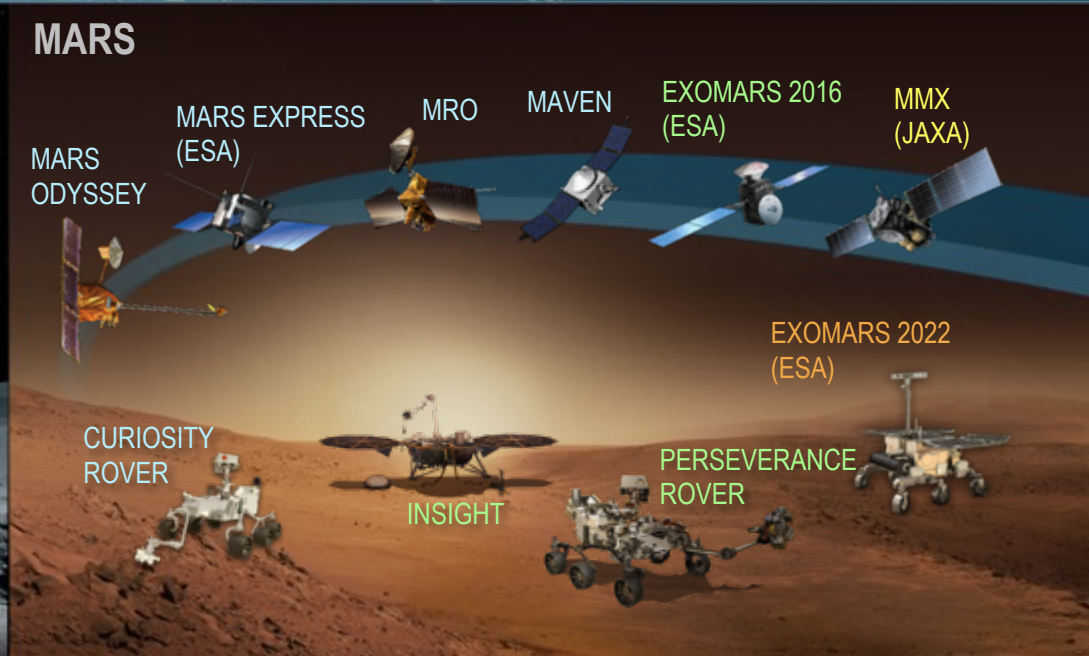
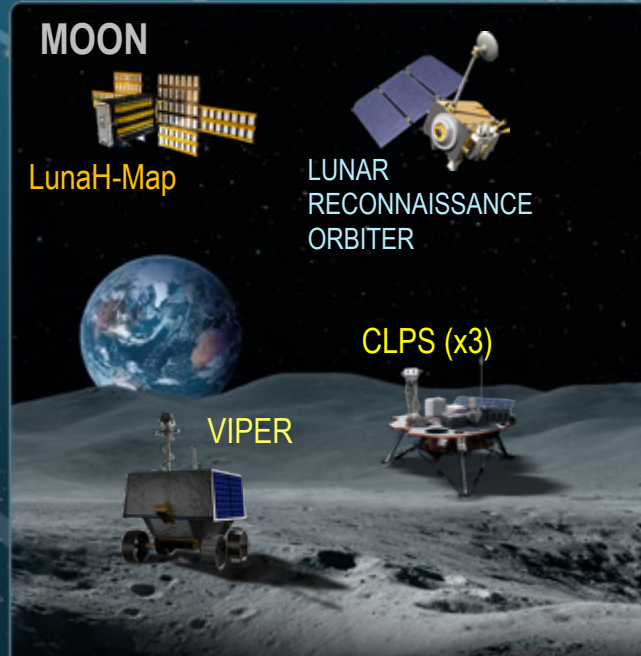
# Current Status





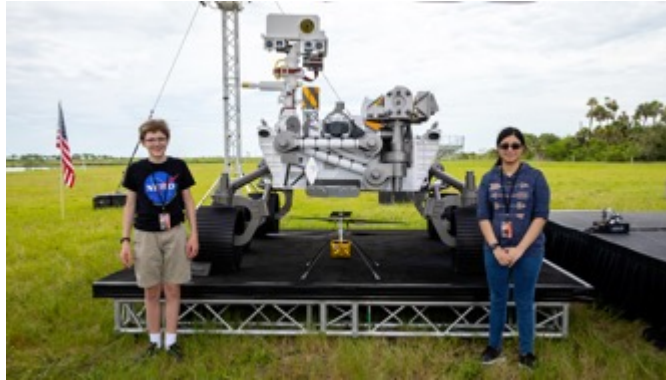


- FORMULATION
- IMPLEMENTATION
- PRIMARY OPS
- EXTENDED OPS

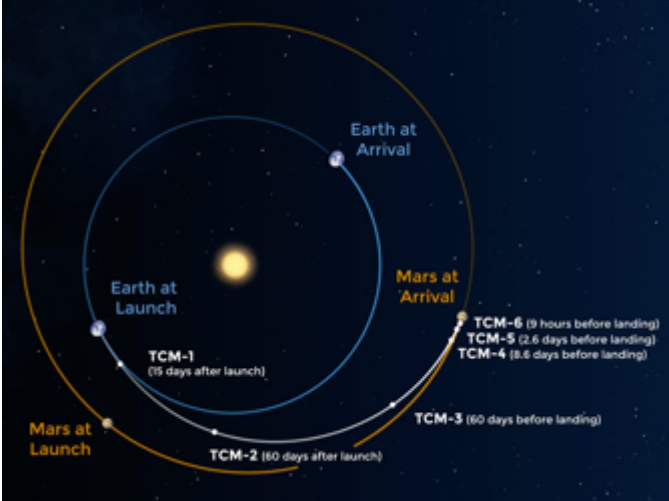
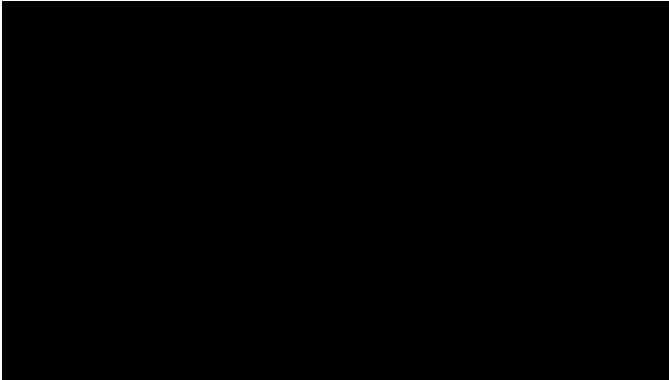




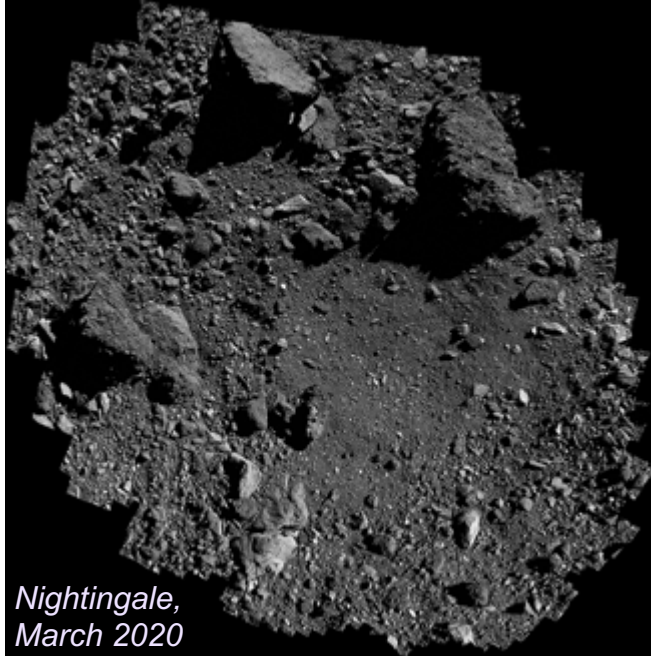
# Mars 2020/Perseverance



- Successful launch on July 30!
- Will land at Jezero crater on Feb 18, 2021
- *Ingenuity* Mars Helicopter (technology demonstration) will attempt up to five powered, controlled flights
- Virtual launch experience highly successful—some metrics as of July 31:
  - 7.1M social media engagements over launch week
    - #CountdownToMars was trending #2 on Twitter at launch
  - 5M views of launch across all platforms
  - 66.2k virtual participants (Eventbrite)
  - Supported by notable accounts, including: Octavia Spencer, Mae Jemison, Peanuts, Lego, several international space agencies, and 15 members of Congress



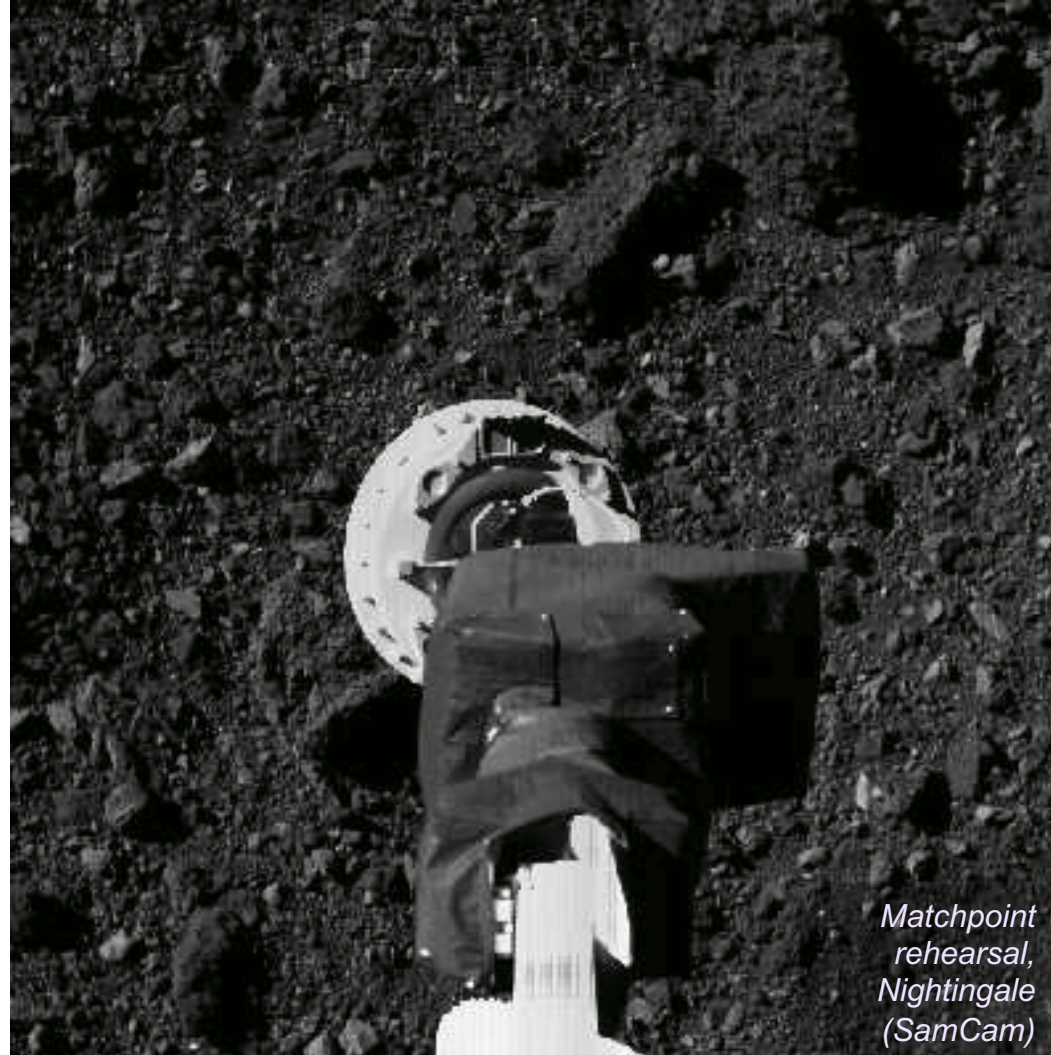
# OSIRIS-REx



*Nightingale,  
March 2020*



*Osprey,  
May 2020*



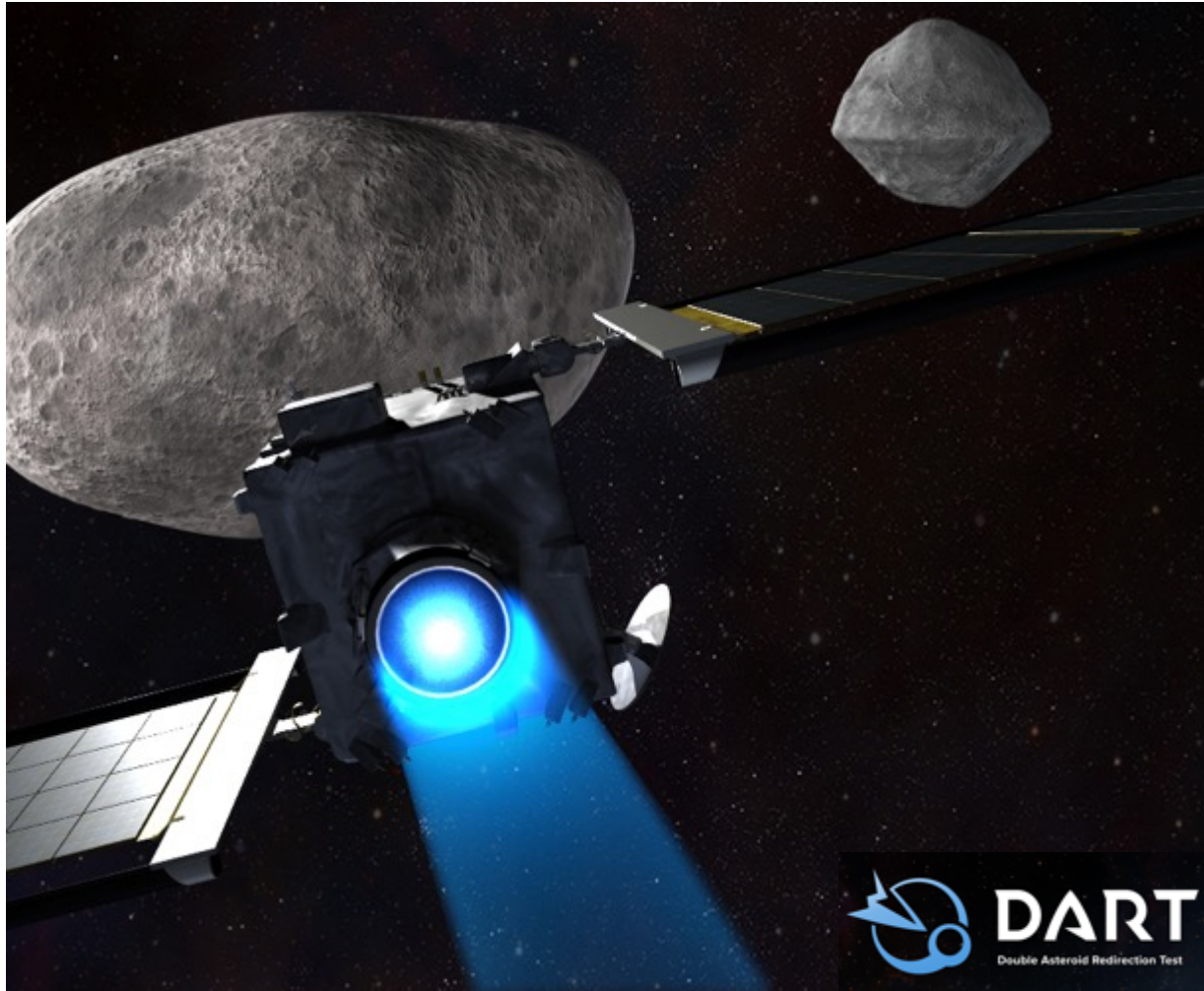
*Matchpoint  
rehearsal,  
Nightingale  
(SamCam)*



- Spring 2020: Completed recon of primary (Nightingale) and secondary (Osprey) sites
- April 14, 2020: Check point rehearsal – 65 m above surface
- Aug 11, 2020: Matchpoint rehearsal – 40 m above surface
- Oct 20, 2020: Sampling event (TAG) at Nightingale



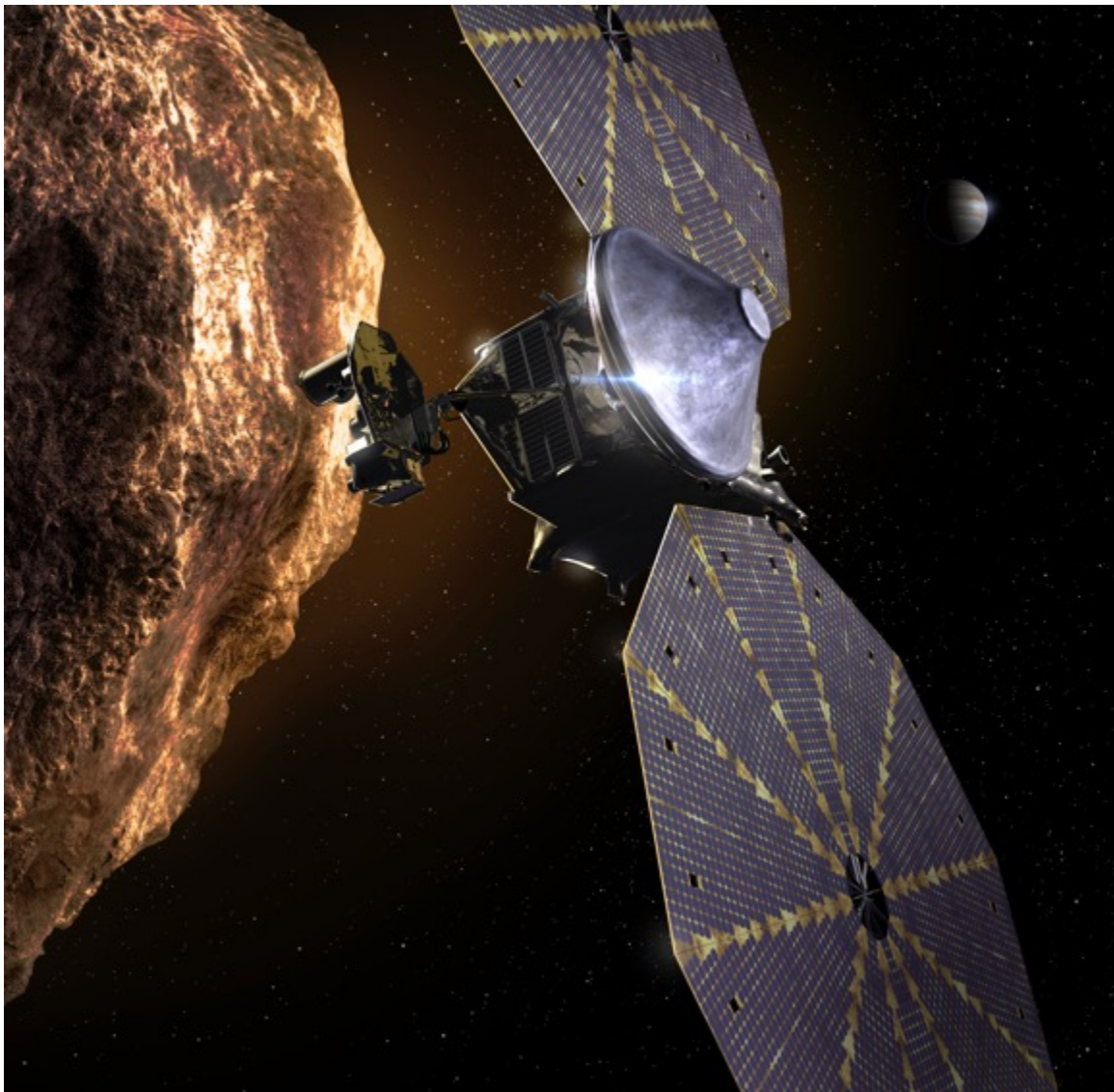
# Double Asteroid Redirection Test (DART)



- First mission to demonstrate asteroid deflection technique; first mission from NASA's Planetary Defense Coordination Office
- Kinetic impact will change the motion of an asteroid
- DART target, Dimorphos, will be only 0.07 AU from Earth at impact in October 2022
- ATLO has started; spacecraft core structure is at APL after COVID-19-related shipping delay
- LICIACube manufacturing, integration and test has started; on track for delivery March 2021
- Mission is on track for July 2021 launch aboard a SpaceX Falcon 9
- Participating Scientist Program ROSES Appendix released June 25, Step-2 deadline: Sep 24, 2020



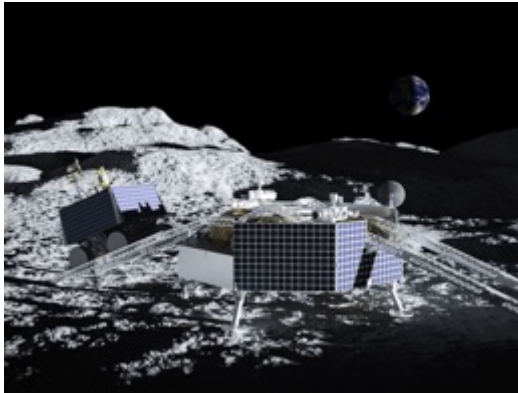
# Lucy



- First mission to the Trojan asteroids
- 12 years, 7 flybys, one spacecraft
- Survey the diversity of an unexplored population
- Passed Critical Design Review (CDR) October 2019, System Integration Review July 2020, and KDP-D August 2020
- ATLO began August 2020; work continues with team's health and safety foremost
- HST imaging has revealed a satellite of Eurybates; follow-up HST visits in progress to pin down orbit
- Launch window opens October 2021
- First Trojan flyby August 2027



# Volatiles Investigation Polar Exploration Rover (VIPER)



*Astrobotic's Griffin Lander selected to deliver VIPER to surface*



*Rover testing at JSC Rockyard*

## Science Objectives:

- Characterize distribution and physical state of lunar polar water and other volatiles in lunar cold traps and regolith, to understand their origin
- Provide data and resource maps necessary for NASA to evaluate the potential return of ISRU from lunar polar regions

## Key Mission Info:

- CLPS (Commercial Lunar Payload Services) Astrobotic lunar delivery by end of 2023
- 100+ Earth-day for 3 lunar day/night cycles
- Instruments: Neutron, Near-IR, and Mass spectrometers; and a 1-m drill

## Project Status:

- Preliminary Design Review (PDR) passed late August; 17 key subsystem/integrated reviews focusing on preliminary design assessment were completed in advance of PDR
- SMD Snapshot Outbrief held September 1
- KDP-C will be in October

# Artemis III



- SMD is formalizing a Science Definition Team (SDT) to define the detailed science objectives of the Artemis III mission
  - Chaired by Dr. Renee Weber, NASA Marshall Space Flight Center and HLS Science Lead
- This is a short-turn-around activity, to provide immediate input to the requirements definition for Artemis formulation and associated hardware development activities
- We will rely heavily on existing community documents (LEAG Lunar Exploration Roadmap, Visions and Voyages, NRC 2007 Report on the Scientific Context for the Exploration of the Moon, and the LEAG Advancing Science of the Moon report)
- Public call for short (1 to 2 page) community papers, focused on science that can be accomplished with humans at the lunar South Pole: >120 papers received



# Europa Clipper

**Project Schedule:** Final instrument CDR was in June, Project & Flight System CDR will be later this year

**Instrument Cost Control:** Steps taken to control cost growth on EIS and MASPEX, including changes to Level 1 requirements

**Gravity/Radio Science Team:** Competitively selected a team of seven, led by Erwan Mazarico (GSFC), to join the Clipper science team

**Launch Vehicle:** LV uncertainty remains a concern; Congress directs use of SLS, but availability before 2025 is not clear

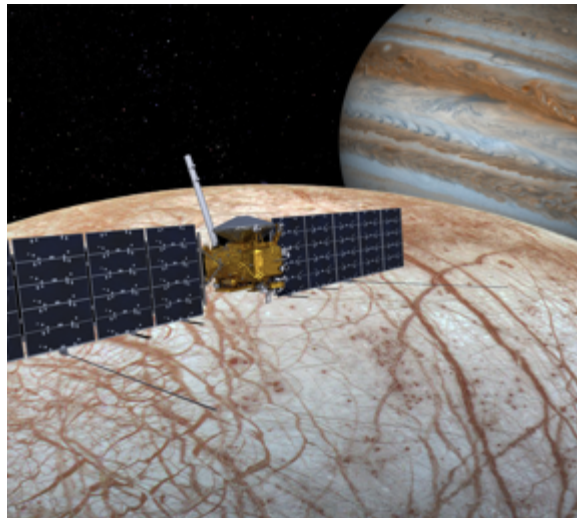
**Instrument & Flight System Hardware:** Now being built!



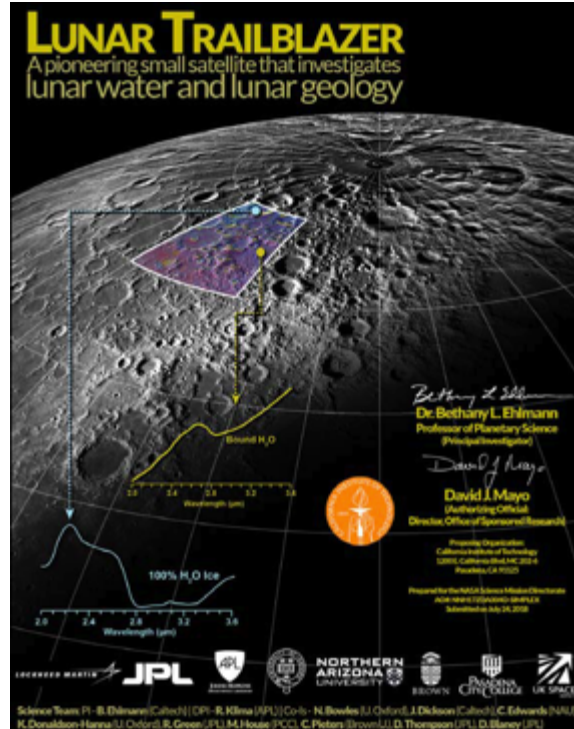
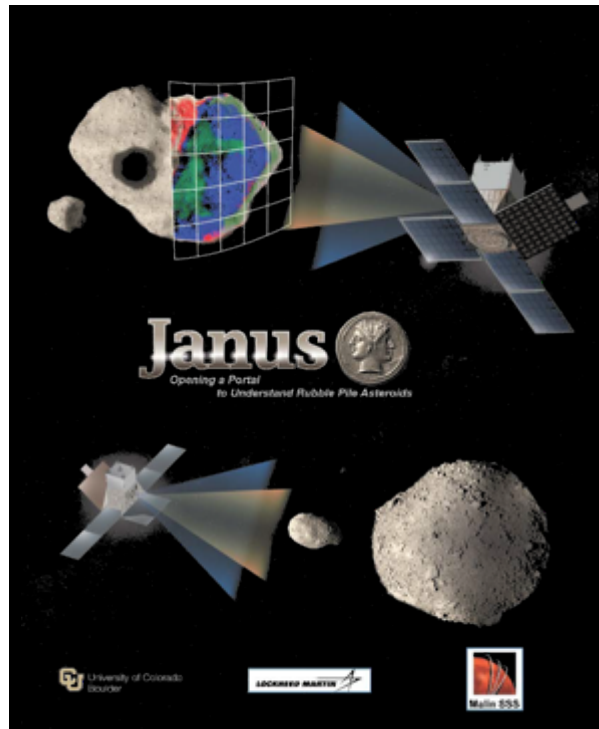
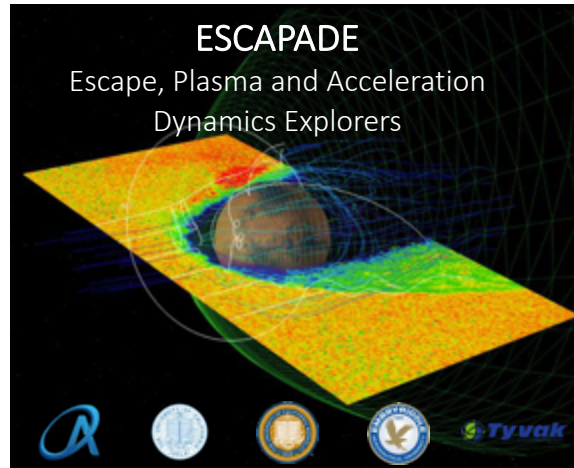
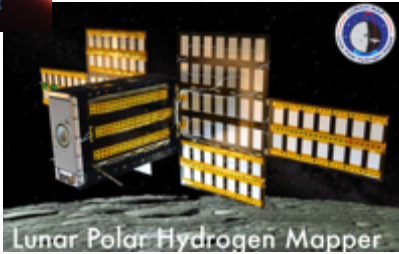
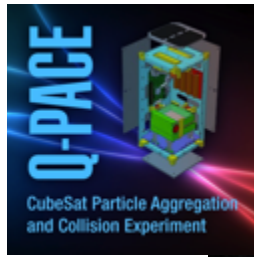
*Above: Upper cylinder of propulsion module*



*Top right: Thermal radiator flight unit*



**EUROPA**  
CLIPPER



# SIMPLEx

## SIMPLEx-1

### Q-PACE:

- Will launch on next flight of Virgin Orbit's LauncherOne (could be as soon as September 30)

### LunaH-Map:

- Will launch on Artemis-1, NLT November 2021
- Delivery required January 2021

## SIMPLEx-2

### Janus:

- PDR held in July; Passed KDP-C on September 3

### ESCAPADE:

- PDR was August 11–13; KDP-C will be April 27, 2021

### Lunar Trailblazer:

- PDR will be week of October 19; KDP-C will be November 24

## SIMPLEx-3

- Release of next opportunity will be NET April 2021

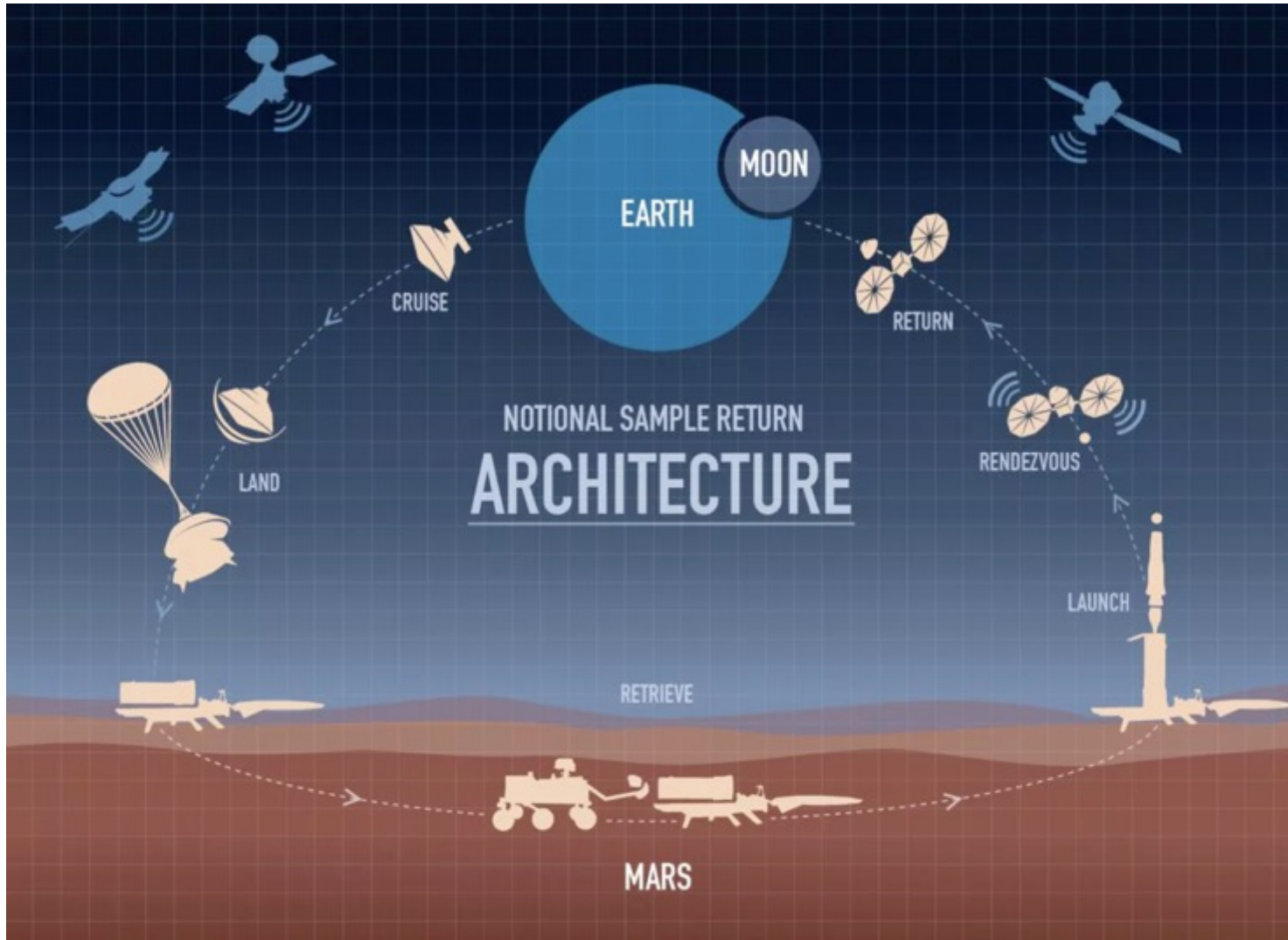


# Mars Sample Return



- Mars Sample Return (MSR) MOU approved by ESA Council and is ready for joint NASA/ESA signature
- New Mars Sample Return Program Director – **Jeff Gramling**
  - Initiated a review of the MSR Program organization and structure
- A separate, dedicated MSR program office will be established at JPL
  - Will report to MSR Program Director at HQ
  - Will be the system-level 'project' organization for MSR
- Michael Meyer will serve as Lead/Chief Scientist for the Mars Exploration Program (MEP) and MSR
  - Provide the science bridge between the programs
  - Ensure coordination of M2020 surface sampling and caching with MSR, and MSR coordination with the future Sample Handling Facility project under MEP
- Mars 2020 Phase-E operations will remain under the Mars Exploration Program, reporting to the Mars Program Manager
- MSR Program will end with the initial containment of the samples (and ERV) at the Earth landing site, per draft Level-1 requirements

# Mars Sample Return – Current Status



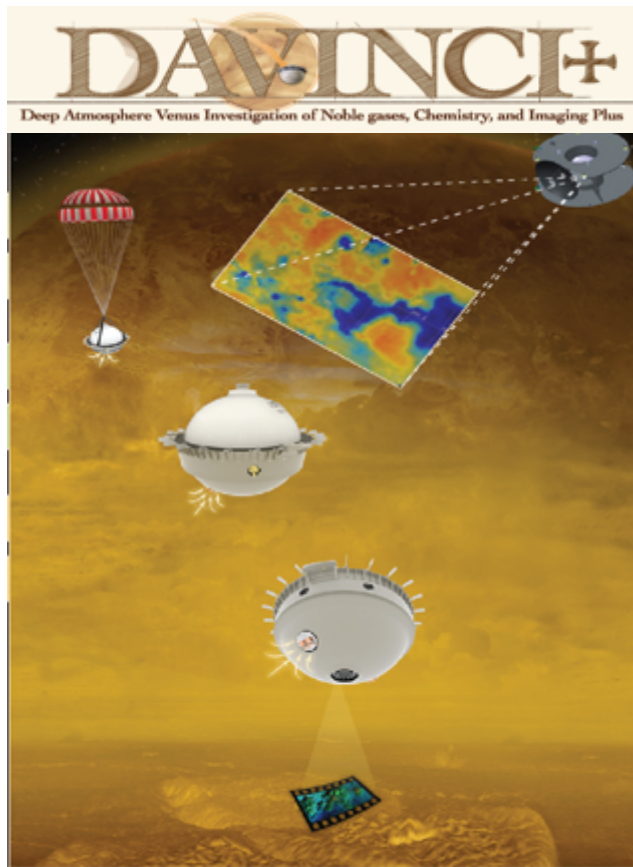
- MSR continues to work towards two launches in 2026 (NASA lander and ESA orbiter) and is on track to enter Phase A this fall
- To align with SMD Flagship Mission model, use lessons learned from past flagship missions, and proceed with a sound technical, cost, and schedule approach:
  - Agency Standing Review Board will conduct Mission Concept Review (MCR) before KDP-A
  - Independent Cost Estimates have been commissioned and are in progress (to be completed before MCR)
  - An Independent Review Board will review the program and deliver its report before KDP-A





# Opportunities





# New Frontiers and Discovery

## New Frontiers #5

- To be released Fall 2022 (current schedule), with community engagement beginning this fall

## Discovery

- Discovery 2019 remains on schedule, despite COVID-19
- Step-2 Concept Study Reports are due November 2020
- Step-2 selections planned for NET April 2021







# CAPS New Frontiers report

- PSD requested CAPS evaluate changes in scientific understanding and external factors that would warrant reconsidering four of the mission themes for New Frontiers #5
- Summary of target body findings:
  - Ocean Worlds (Enceladus): retain, since changes in scientific understanding and/or external factors do not warrant reconsideration
  - Ocean Worlds (Titan): remove Titan, since Dragonfly addresses preponderance of the science objectives and for programmatic balance
  - Trojan Tour and Rendezvous: remove, since Lucy addresses the preponderance of the science objectives
  - Io Observer: remove if IVO selected by Discovery, if science objectives remain so similar; retain if not selected by Discovery or science objectives significantly changed
  - Lunar Geophysical Network: retain, since changes in scientific understanding and/or external factors do not warrant reconsideration
- SMD places great weight on the CAPS report and respects their role as the keepers of the Decadal Survey; community announcement coming soon



# PSD Portfolio Audit

- NASA's Office of Inspector General (OIG) has been conducting an audit of PSD's portfolio over the last year to examine if the division is meeting established goals and priorities
- This is part of a series of science portfolio audits being conducted by the OIG (Earth and Helio divisions already complete)
- Once released, PSD will brief the PAC on the OIG's recommendations and our response plans at the next opportunity





# Research and Analysis



# Research and Analysis (R&A) Updates

- Budgetary considerations:
  - Planetary Science and Technology from Analog Research (PSTAR) not being solicited in ROSES20 (biennial starting with ROSES21)
  - Habitable Worlds (HW) not being solicited in ROSES21
- Dual Anonymous Peer Review (DAPR) is proceeding with:
  - HW in ROSES20
  - All of the data analysis programs (MDAP, LDAP, CDAP, NFAP, DDAP) in ROSES21
- Solar System Workings ROSES19 low selection rates:
  - Overall budget requests in proposals have gone up since program inception from \$125M to \$192M—growth of 53% in 5 years
  - Significant efforts in past years were made to keep selection rates up, but were dependent upon continuing increases in the R&A budget
  - Reduced budgets in FY19 and FY20 made it impossible to continue at historical selection rates
  - Goal is to improve this with sustainable and consistent out-year budget plans
- Facilities: plans are being developed but cannot implement a new program without additional budget.



# Research and Analysis (R&A) Updates

- COVID-19 Augmentations:
  - Expressions of interest received; overall request much higher than available budget
  - Discussions of next steps are under way.
- Virtual review panels have been going well:
  - **Thank you** to all those who have served (or will do) as reviewers and to our Program Officers for all their work at this difficult time
  - Virtual reviews likely to continue post-COVID, for at least a significant proportion of panels
- Exploring moving some PSD R&A Programs to a No Due Date (NoDD) format

## Upcoming Deadlines:

	Step-1 Deadline	Step-2 deadline
PICASSO	Sep 18	Nov 20
DART PSP	passed	Sept 24
DDAP	passed	Oct 30
NFDAP	passed	Nov 5
MDAP	Sep 25	Nov 20
ECA	n/a	Dec 8



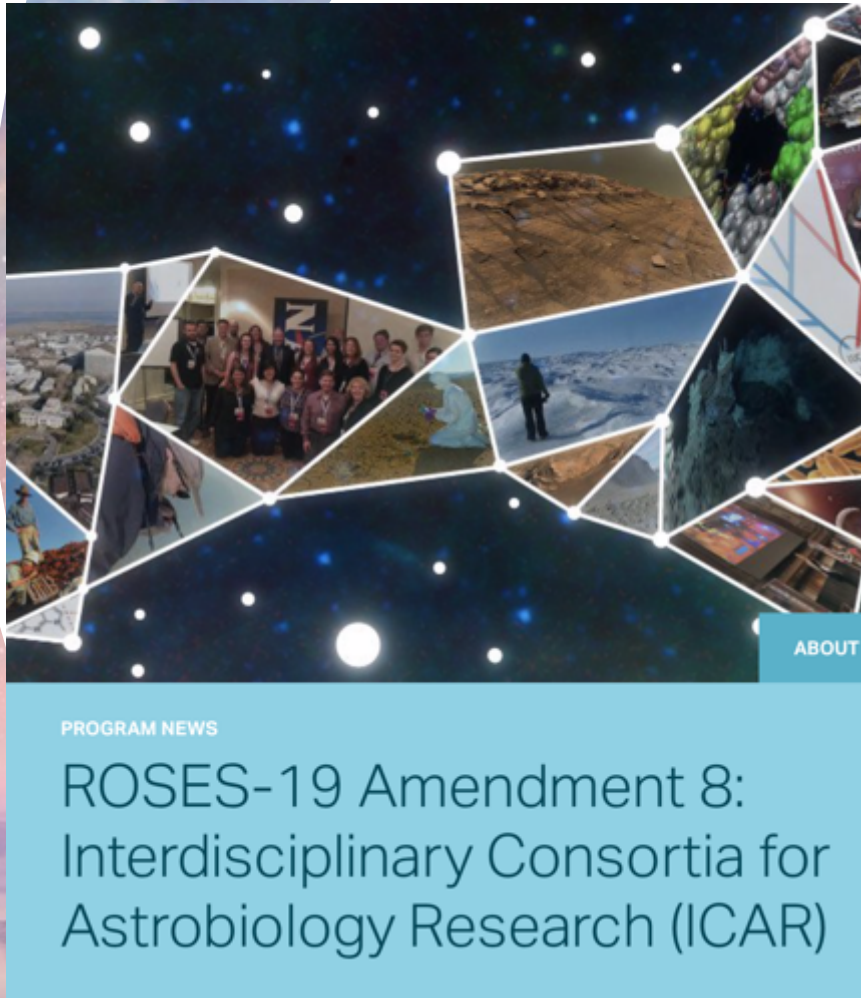
# Raising Astrobiology's Profile

- Incorporate astrobiology themes and personnel into the communications strategy, products, and events for PSD missions relating to NASA's study of habitable worlds, the search for life in the universe, and looking into the distribution and delivery of organics in our solar system, including Mars 2020, Europa Clipper, Dragonfly, and OSIRIS-REx
- Interface with internal stakeholders (SMD, HEOMD, OCOMM and Agency leadership) to ensure astrobiology is incorporated into mission and thematic content
- Define and implement a digital communications strategy for the Astrobiology program with short- and long-range objectives across multiple centers and missions
- Maintain an active presence on the astrobiology social media accounts to engage learners of all ages and levels of education
- Increase production of astrobiology communications products for the web and social media
- Engage with the astrobiology science community to enhance our communications efforts and highlight the individual faces and stories behind astrobiology



# Astrobiology Research

- Solicitation: NNH19ZDA001N-ICAR
- Targeted timing:
  - First Solicitation: Released November 25, 2019
  - May 15, 2020: 30 Step 2 proposals received
  - Fall 2020: new ICAR awards start
- Areas of research emphasis in this solicitation are linked to Research Coordination Network (RCN) topics:
  1. Nexus for Exoplanet System Science - NExSS
  2. Prebiotic Chemistry and Early Earth Environments - PCE<sub>3</sub>
  3. Earliest Cells and Multicellularity
- Selected proposals become part of the Research Coordination Network (RCN)
- Calls will occur on the order of every two years
  - RCN topics that will be included will be staggered



# Astrobiology Research Coordination Networks

## Exoplanet System Science (NExSS)

- Workshops/webinars; PSD Decadal Preparation; Science and Communication Working Groups
- PIs invited to submit proposals through relevant ROSES calls in PSD, APD, HPD, ESD



## Network For Life Detection (NfoLD)

- Regular science webinars – research and life detection forum
- Invited 26 PIs from 5 PSD R&A programs; 92% acceptance rate



## Prebiotic Chemistry and Early Earth Environments (PCE<sub>3</sub>)

- Virtual meeting late summer 2020: primer talks on major topics
- Invited 33 PIs from Exobiology and Emerging Worlds programs; 76% acceptance rate



## Network for Ocean Worlds (NOW)

- Kick-off meeting December 2019; introductory presentations at OPAG and AGU meetings; quarterly lectures; Decadal White Papers
- Projects from >14 PSD and ESD programs



## Earliest Cells to Multicellularity

- Received nine responses to request for information on themes, structure, and operation; contributors spanned notional scope





# Decadal Survey



# Decadal Survey on Planetary Science and Astrobiology



- Co-Chairs announced: **Robin Canup** (SWRI) and **Philip Christensen** (ASU)
  - Community Paper deadlines were staggered in response to feedback from community—all deadlines have now passed
  - Deadlines were important to ensure that Decadal Survey results can feed into the budget planning cycle
- Steering Committee members announced September 14: <https://www.nationalacademies.org/our-work/planetary-science-and-astrobiology-decadal-survey-2023-2032#sectionCommittee>
- Planetary Mission Concept Study reports were received and sent to NASEM
  - Science Definition Team reports for VeneraD, Europa Lander, Ice Giants, Mars Ice and Climate Evolution Science Analysis Group and Next Orbiter Science Analysis Group were also sent





# Notional Timeline for 2023 Decadal Survey

## 2019

September

Organizing meeting and town hall at EPSC-DPS

October

Draft statement of task received from NASA

November

LPI launches community paper proposal website

December

Town hall at AGU meeting

## 2020

January

National Academies posts Statement of Task

February

Funding proposal to NASA, NSF agree to support

March

Early-career event and town hall at LPSC

Spring

Community paper submission begins, chair announced

Summer

Community paper deadline and meetings begin

## 2021

Autumn

Complete draft of survey report assembled

## 2022

Spring

Survey report released, dissemination starts

## 2023

End of dissemination/NASA contract



EXPLORE  
with us