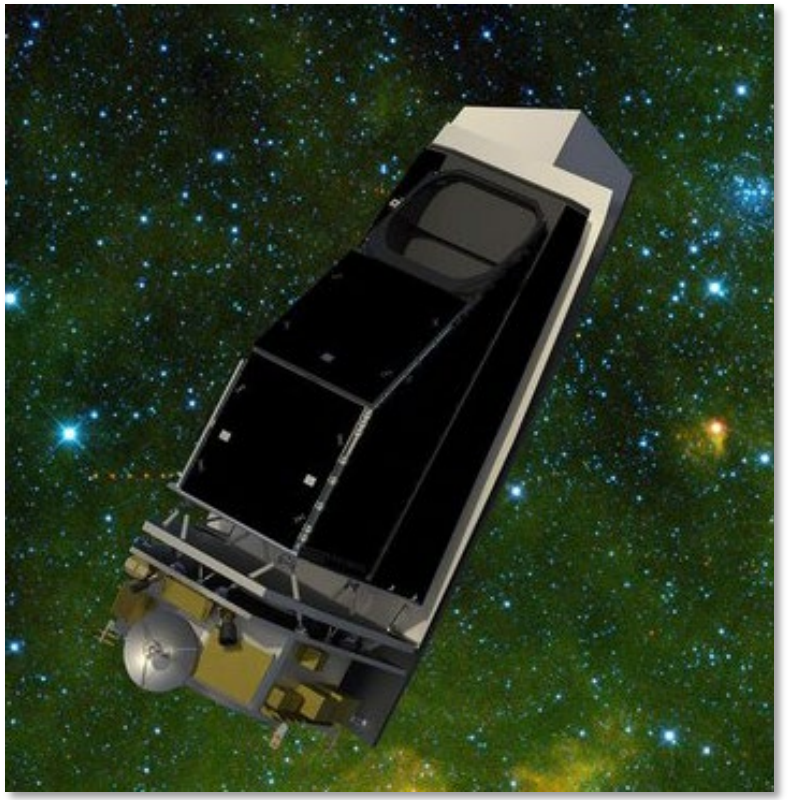

National Aeronautics and
Space Administration
NASA
EXPLORE
SCIENCE
Lori S. Glaze, Ph.D.,
NASA Planetary Science Division Director
CAPS
March 28, 2023

Budget: FY23 Enacted

FY 2023 Enacted Budget

- NASA's FY 2023 Appropriations for PSD: $3.2B
  - 2.5% growth over FY 2022
  - $40M over PSD request ($3.16B)
  - Increases to Dragonfly and NEO Surveyor total ~$60M, so there is still a $20M gap
- Includes continued support for:
  - MSR
  - LDEP, including VIPER (at 'not less than' level) and CLPS (at 'up-to' level)
- Awaiting approval of initial operating plan



($M)	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
PSD	1,342.3	1,446.7	1,628.0	1,827.5	2,217.9	2,746.7	2,712.6	2,693.2	3,120.4	3,200.0


Budget: FY24
President's
Budget Request

FY24 SMD Budget Priorities

Build an innovative and balanced program driven by the highest national priorities

Advance Moon to Mars objectives and lead Artemis science

Promote US leadership in Earth system science

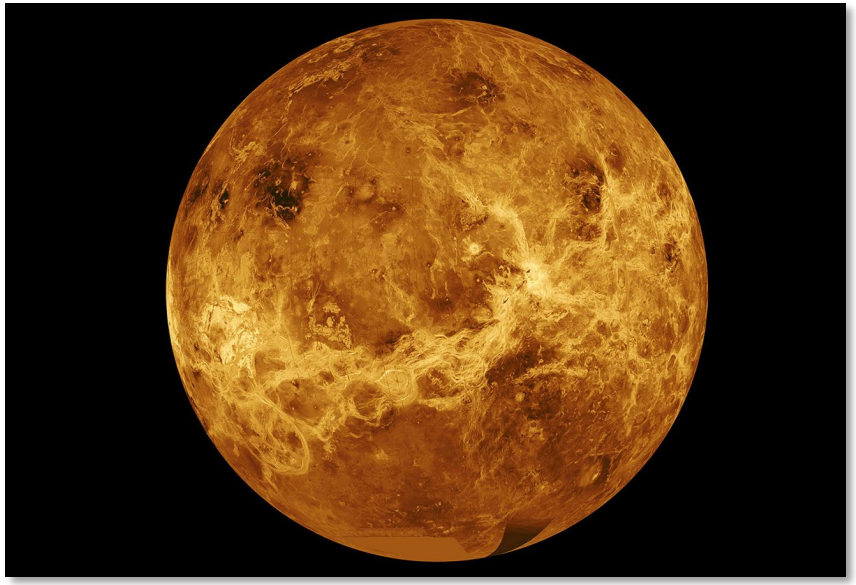
Broaden participation and increase diversity in science

Advance open science for all and leverage cutting edge data science techniques

FY2024 Science Budget Request Summary ($M)

	Actual FY22	Enacted FY23	Request FY24	Out-Years FY25	FY26	FY27	FY28
Science	**$7,610.9**	**$7,795.0**	**$8,260.8**	**$8,426.0**	**$8,594.5**	**$8,766.4**	**$8,941.7**
Earth Science	$2,061.2	$2,195.0	$2,472.8	$2,597.5	$2,730.0	$2,791.2	$2,849.0
Astrophysics	$1,568.9	$1,510.0	$1,557.4	$1,622.1	$1,665.9	$1,689.6	$1,749.4
Heliophysics	$777.9	$805.0	$750.9	$837.4	$847.3	$827.4	$844.0
Biological and Physical Sciences	$82.5	$85.0	$96.5	$103.2	$105.3	$107.4	$109.6
Planetary Science	**$3,120.4**	**$3,200.0**	**$3,383.2**	**$3,265.8**	**$3,246.1**	**$3,350.8**	**$3,389.7**
Planetary Science Research	$309.0		$307.4	$333.3	$352.0	$360.2	$386.4
Planetary Defense	$166.0		$250.7	$337.7	$400.5	$299.6	$79.0
Lunar Discovery and Exploration	$478.8		$458.5	$459.0	$460.5	$472.0	$483.3
Mars Sample Return	$653.2		$949.3	$700.0	$600.0	$612.1	$627.6
Discovery	$331.8		$247.5	$386.4	$426.0	$579.2	$625.9
New Frontiers	$283.7		$407.5	$447.8	$386.1	$367.3	$337.5
Mars Exploration	$265.0		$268.6	$279.2	$311.6	$315.3	$367.2
Outer Planets and Ocean Worlds	$484.3		$318.4	$121.3	$134.8	$178.3	$321.9
Radioisotope Power	$148.6		$175.5	$201.1	$174.6	$166.8	$160.9

Planetary Science Budget Features



Computer simulated global view of Venus

Nightside of Venus taken by the Wide-field Imager on Parker Solar Probe

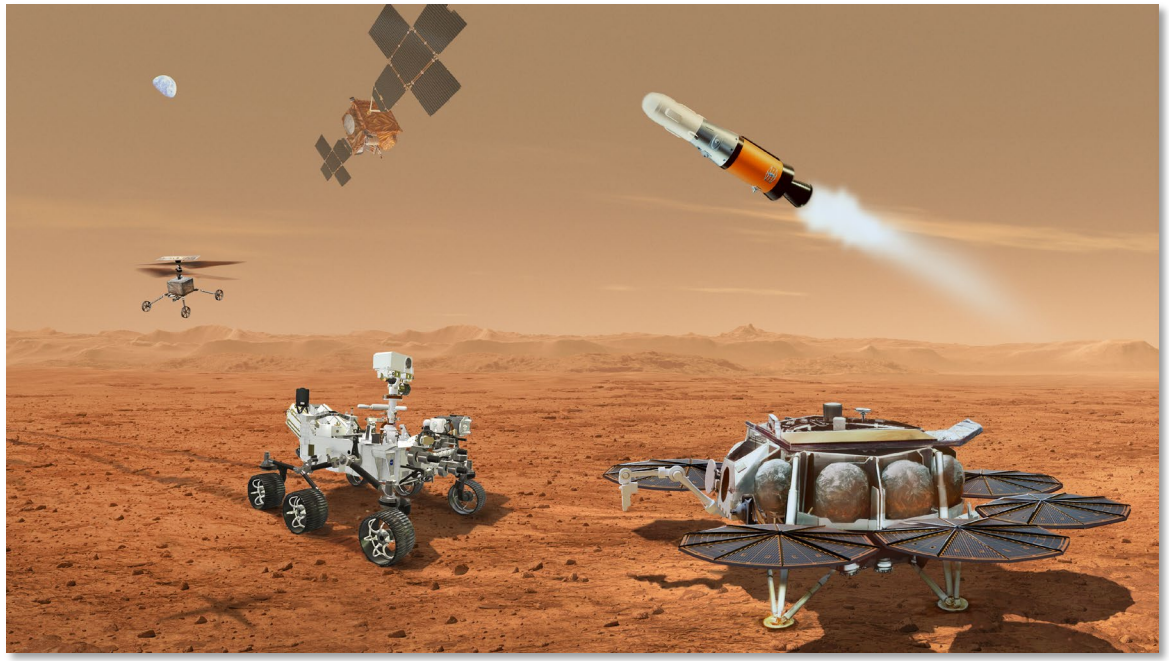
What's Changed

- Supports NEO Surveyor development for estimated launch in 2028
- Increased R&A budget to make progress towards Decadal recommendation of 10% R&A investment relative to division budget and to improve selection rates
- Additional funding for Dragonfly and Mars Rover 2020 extended operations
- Increased funding for Psyche mission to support October 2023 LRD
- Significantly expanded support for the ESA Rosalind Franklin mission
- Delay of the VERITAS mission by at least three years
- No funding for the Janus mission; demanifested as Psyche rideshare
- SIMPLEx funding reduction supports one selection (with an increased cost cap of $85M) to fly with the DAVINCI mission in 2030
- InSight mission declared successfully completed in December 2022
- New Horizon extended mission ends in 2024
- OSIRIS-REx spacecraft transition to Apophis Explorer in FY 2024
- Eliminates Dynamic RPS and associated technology investments as there is no future Planetary mission requiring this technology

What's the Same

- NF-5 AO planned for Nov 2023; Discovery AO planned for FY25
- Missions in formulation & development: Europa Clipper, DAVINCI, EnVision
- Sustained support for Near Earth Object Observations
- Funding support for 13 operating missions

Mars Sample Return Budget Features



- To maintain progress in FY24 towards earliest possible launch date, FY24 budget request is $949.3M, a $127M increase over the FY23 Enacted
  - NASA has delayed MSR confirmation into Q1 FY24 while we conduct additional independent assessments of mission design, life cycle costs and schedule. FY25–28 budgets are expected to grow over the current estimates
  - NASA will consider potential descopes such as the elimination of one of the mission's two helicopters, in order to improve the cost posture of the mission
- Request supports Sample Retrieval Lander (SRL), Mars Ascent Vehicle (MAV), Capture, Containment and Return System (CCRS) element requirements, and development of 2 helicopters
  - Earth Return Orbiter/CCRS launch NET 2027
  - SRL launch no earlier than 2028
  - Sample return no earlier than 2033
- Assumes contributed elements including
  - ERO and Sample Transfer Arm from ESA
  - Mars sample receiving facility within Mars Exploration Program

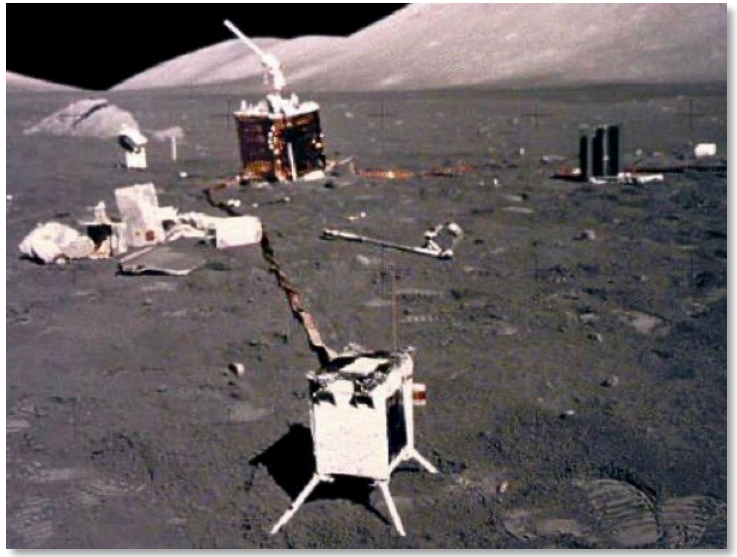
Lunar Discovery and Exploration Program Budget Features

What's changed

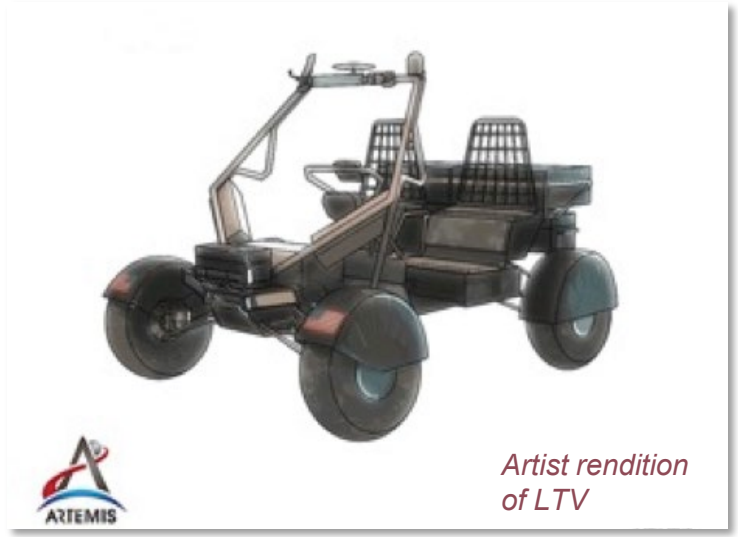
- Increased lunar science research for science team, curation work to support Artemis III in 2025
- Accelerated Lunar Trailblazer rideshare launch from 2025 on IMAP to 2023 on IM-2
- Added support for LuSEE-Night instrument development with DOE
- Created an Artemis Instrument line to develop handheld and deployed instruments for crew beyond Artemis III
- Increase to VIPER for delay (2023 to 2024) to accommodate additional propulsion tests to reduce risk for Astrobotic Griffin Lander, as requested by NASA
- Reduced CLPS funding FY24-25 to accommodate delayed VIPER delivery; enhanced systems engineering and technical support to CLPS vendors
- Added Endurance-A mission science objectives / implementation concept studies

What's the same

- Annual PRISM calls for instruments
- Lunar Reconnaissance Orbiter operations
- Initial Artemis instruments, Lunar Terrain Vehicle (LTV) instruments

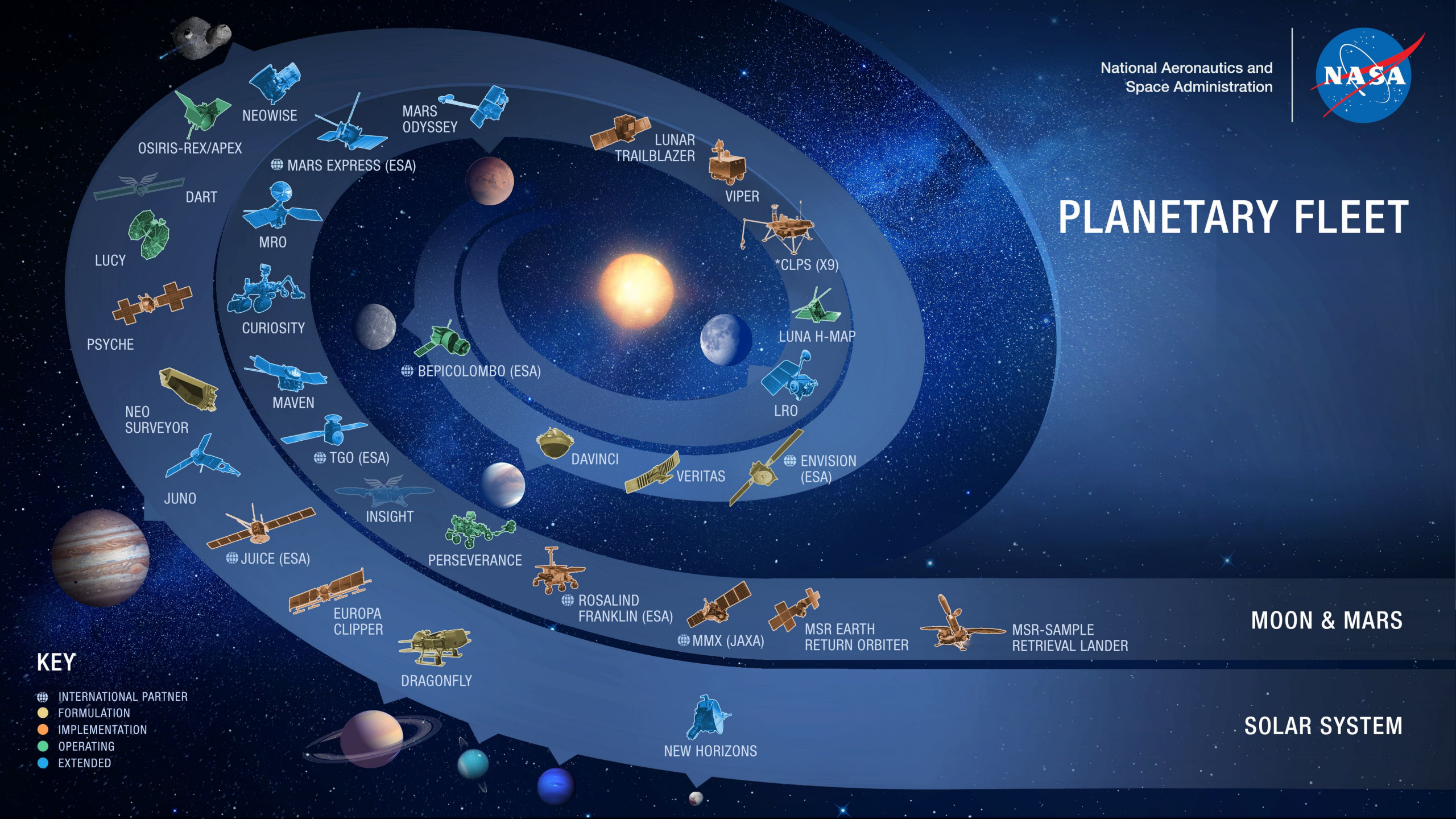


Deployed instruments during Apollo 17



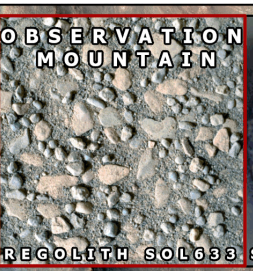
Artist rendition of LTV

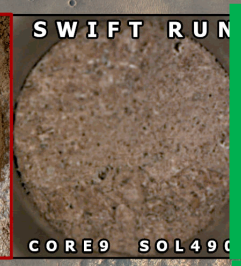
Mission Updates

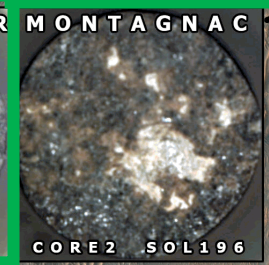

National Aeronautics and Space Administration
NASA
PLANETARY FLEET
NEOWISE
OSIRIS-REX/APEX
MARS ODYSSEY
MARS EXPRESS (ESA)
LUNAR TRAILBLAZER
VIPER
DART
MRO
*CLPS (X9)
LUCY
CURIOSITY
LUNA H-MAP
PSYCHE
BEPICOLOMBO (ESA)
LRO
MAVEN
NEO SURVEYOR
TGO (ESA)
DAVINCI
VERITAS
ENVISION (ESA)
JUNO
INSIGHT
JUICE (ESA)
PERSEVERANCE
EUROPA CLIPPER
ROSALIND FRANKLIN (ESA)
MMX (JAXA)
MSR EARTH RETURN ORBITER
MSR-SAMPLE RETRIEVAL LANDER
MOON & MARS
DRAGONFLY
NEW HORIZONS
SOLAR SYSTEM
KEY
INTERNATIONAL PARTNER
FORMULATION
IMPLEMENTATION
OPERATING
EXTENDED

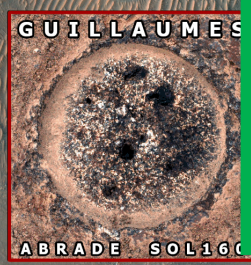
MARS 2020 PERSEVERANCE Sample Collection Map: Tubes 1-21

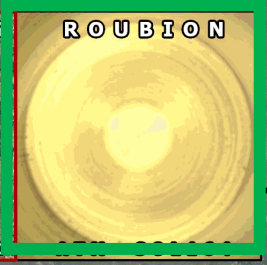
Green highlights tubes cached at Three Forks











WILDCAT RIDGE

SKINNER RIDGE

WITNESS SAMPLE 2

HIDDEN HARBOR

OBSERVATION MOUNTAIN

AMALIK

WITNESS SAMPLE 3

SID

WITNESS SAMPLE 1

BRAC

ISSOLE

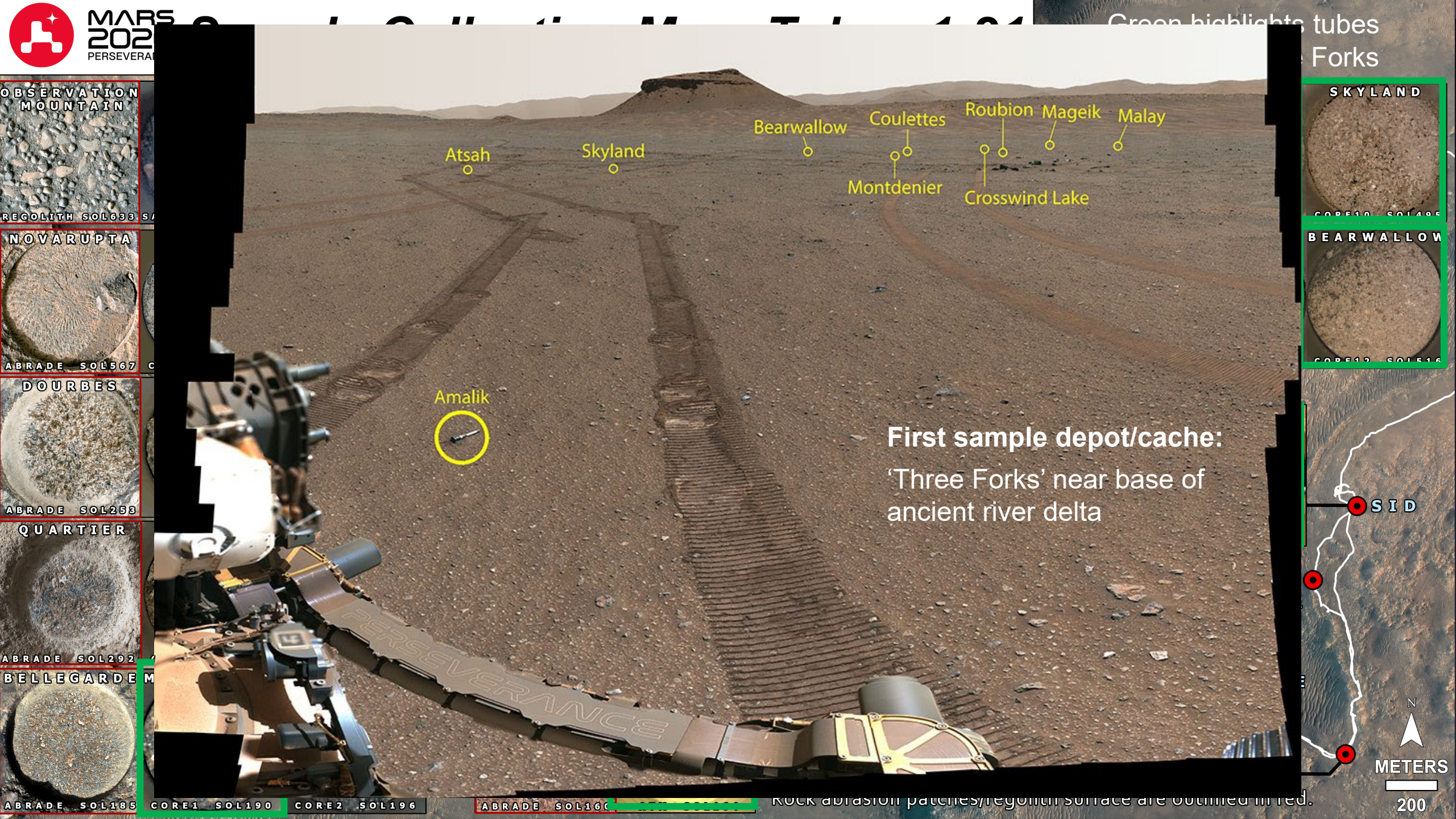
ROCHETTE

N

METERS

200

Rock abrasion patches/regolith surface are outlined in red.


MARS 202
PERSEVERA
Green highlights tubes
Forks
OBSERVATION MOUNTAIN
REGOLITH SOL633
NOVARUPTA
ABRADE SOL567
DOURBES
ABRADE SOL253
QUARTIER
ABRADE SOL292
BELLEGARDE
ABRADE SOL185
CORE1 SOL190
CORE2 SOL196
ABRADE SOL160
SKYLAND
BEARWALLOW
Atsah
Skyland
Bearwallow
Coulettes
Roubion
Mageik
Malay
Montdenier
Crosswind Lake
Amalik
First sample depot/cache:
'Three Forks' near base of ancient river delta
SID
N
METERS
200
Rock abrasion patches/regolith surface are outlined in red.

Mars Sample Return

- Several element and program reviews during **path to confirmation**
  - Independent Review Board: May–Jul 2023
  - MSR Program/System PDR: Sep 2023 (TBC)
  - Confirmation/KDP-C: Early FY24
- Joint ESA-NASA MSR Campaign Science Group (MCSG) has been established and Science MOU signed
  - Upcoming opportunity for science community involvement: open call for **Measurement Definition Team members**
- **Backward Planetary Protection** (BPP) Implementation:
  - First mission to implement ‘break the chain’ BPP method
  - Consistent with NASA and international BPP policies to achieve a very low risk of harm to Earth’s biosphere from sample return
  - Independent review of the approach will be conducted
- **Sample Receiving Project** (SRP) established at JSC (Dec 2022) and preparing for Mission Concept Review
  - Working with science community to define future science investigations and required instrumentation

New Horizons

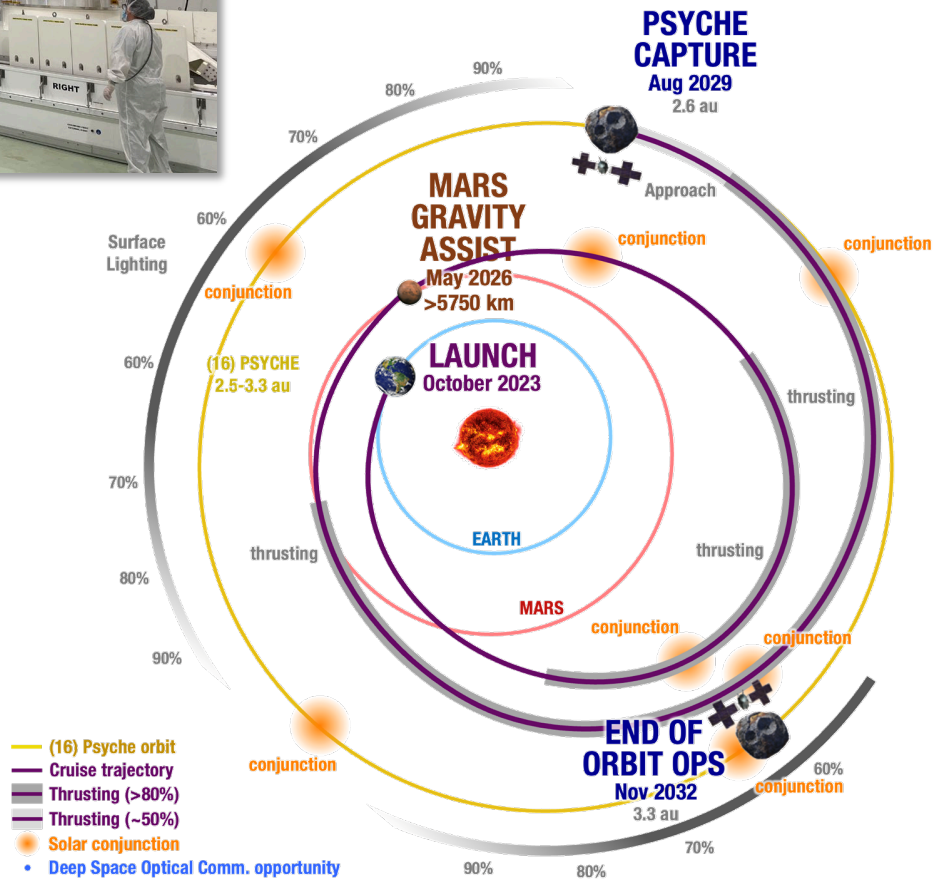
- SMD Multi-panel review of New Horizons was held in summer of 2022, led by Planetary Science Mission Senior Review (PSMSR) process
  - Demonstrated excellent science value that New Horizons could bring as a Heliophysics Division (HPD) mission
    - Continued operation of New Horizons would allow important questions about the heliosphere to be addressed from its unique position in the solar system
  - Demonstrated little more planetary science can be achieved by the mission
    - The chance of finding another Kuiper Belt Object for a close approach is unlikely
- PSD and HPD are coordinating on the future of New Horizons
  - HPD, in coordination with PSD and APD, released a Request for Information (RFI) on March 15, 2023 (https://go.nasa.gov/NewH23IMRFI), to understand the potential science that could be achieved with New Horizons should it continue operations beyond FY24
    - Responses to RFI due April 17, 2023

Psyche & Janus

Psyche after removal from storage facility at Astrotech, November 2022

Psyche

- Launch period: **October 5–25, 2023**
  - Arrives at Psyche August 2029
  - No new Ops activities/processes required
  - Does not stress spacecraft design
- ATLO 1.0 completed; spacecraft is in maintenance mode until ATLO 2.0 begins June 2023
- JPL working closely with project to maintain level of experienced staff to complete remaining work prior to launch
- Status DPMC held February 2023: Phase-E cost profile approved
- IRB review held March 21–23, 2023

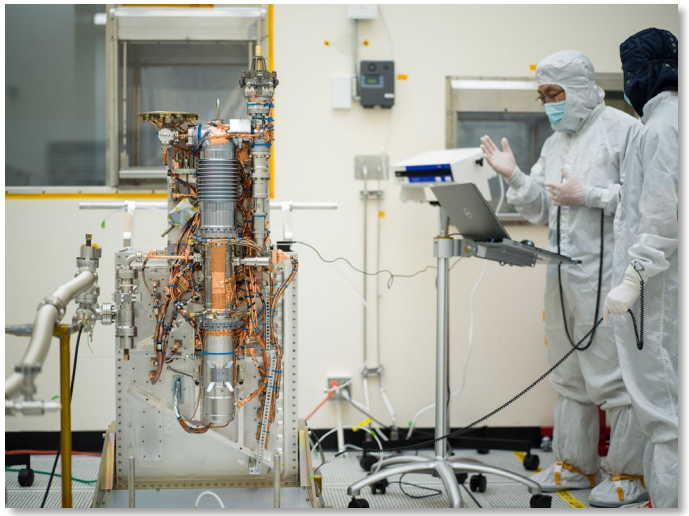


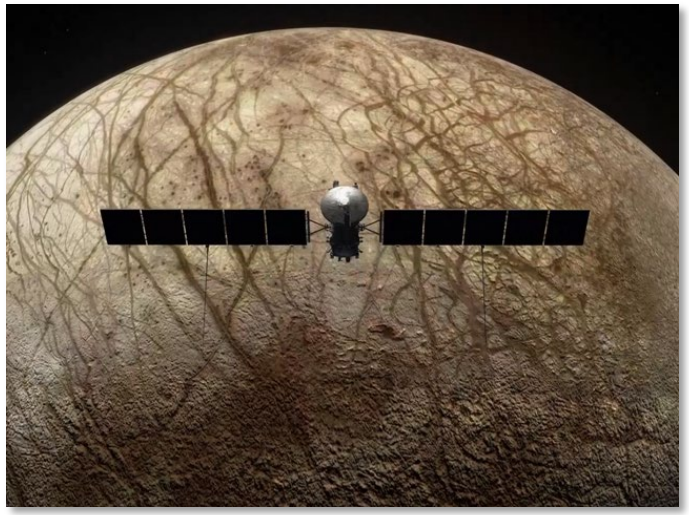
Janus (SIMPLEX-2)

- Removed from Psyche's 2023 launch manifest
  - Would not be on a trajectory to meet science requirements
- Spacecraft reside at Lockheed Martin

Europa Clipper

- ATLO pace is accelerating: live feed from High Bay
- Six (of nine) science instruments have been delivered:
  - Plasma Instrument for Magnetic Sounding (PIMS)
  - Europa Imaging System Wide-Angle Camera (EIS WAC)
  - Europa Thermal Emission Imaging System (E-THEMIS)
  - Europa Ultraviolet Spectrograph (E-UVS)
  - Surface Dust Analyzer (SUDA)
  - Mass Spectrometer for Planetary Exploration (MASPEX)
- More hardware and science instruments expected by end of March 2023
- Target launch: October 2024
- Jupiter Orbit Insertion: April 2030





MASPEX instrument delivered to JPL, December 2022

Solar array 'wings' in cleanroom at Airbus, Leiden

Avionics module atop the propulsion module

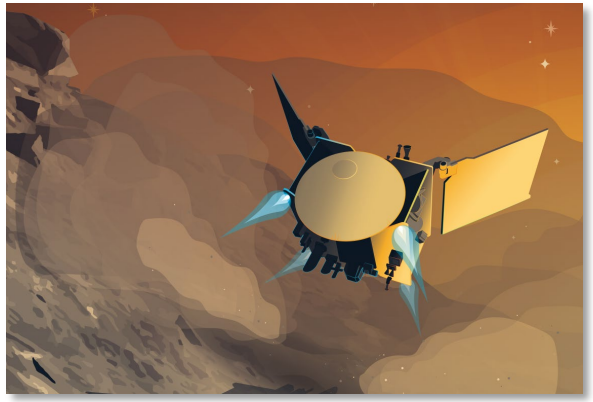
VERITAS Status

- NASA anticipates delaying the VERITAS launch to no earlier than 2031
  - Providing FY23 funding for orderly stand down
  - Providing funding for continued science team support
- Restart will be contingent on funding and progress on IRB issues
- PSD/SMD will pursue funding to support both VERITAS and the next Discovery AO through the FY2025 budget process

PSD Budget Considerations

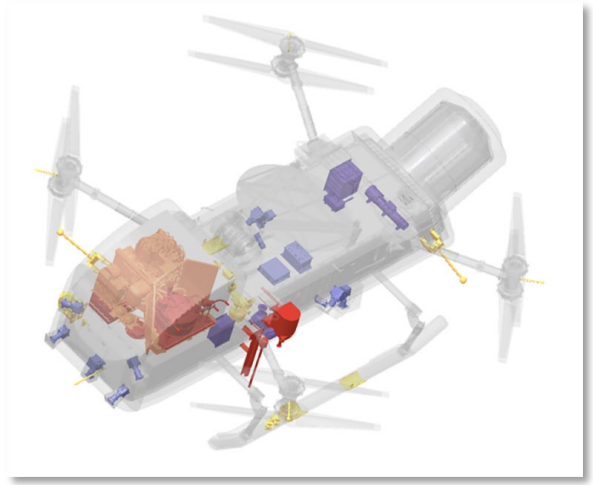
- Absorbed significant COVID-related costs
- Accommodated Phase-E increases to several missions
- Need to accommodate increased costs on projects in formulation
  - Inflation
  - Long-lead-time (rephasing) issues
- Must accommodate lower budget than anticipated when last two Discovery selections were made
  - FY22 appropriation $80M less than President's request
  - FY23 President's request also lower

Other Mission Updates



Lucy

- Added encounter of Asteroid 1999-VD57 (Dinkinesh) in November 2023 will be a risk-reduction and calibration exercise
- First Earth gravity assist (EGA) on October 16, 2022 was successful; spacecraft's two-year heliocentric orbit will bring it back for second EGA in October 2024



JUICE

- Spacecraft arrived at Kourou launch site February 2023 for integration with Ariane 5 launch vehicle
- Launch window is April 5–25, 2023 (target launch date April 13)

OSIRIS-REx/APEX

- Bennu samples land at Utah Test and Training Range September 24, 2023
- Spacecraft will visit Apophis after its close approach to Earth (April 2029) for an 18-month investigation

Lunar Trailblazer

- Both science instruments have been delivered for integration on the spacecraft
- Delivery into storage expected May 2023; launch with CLPS IM-2 in Q4 of 2023

Dragonfly

- Successfully passed all technical requirements for mission PDR, March 2023

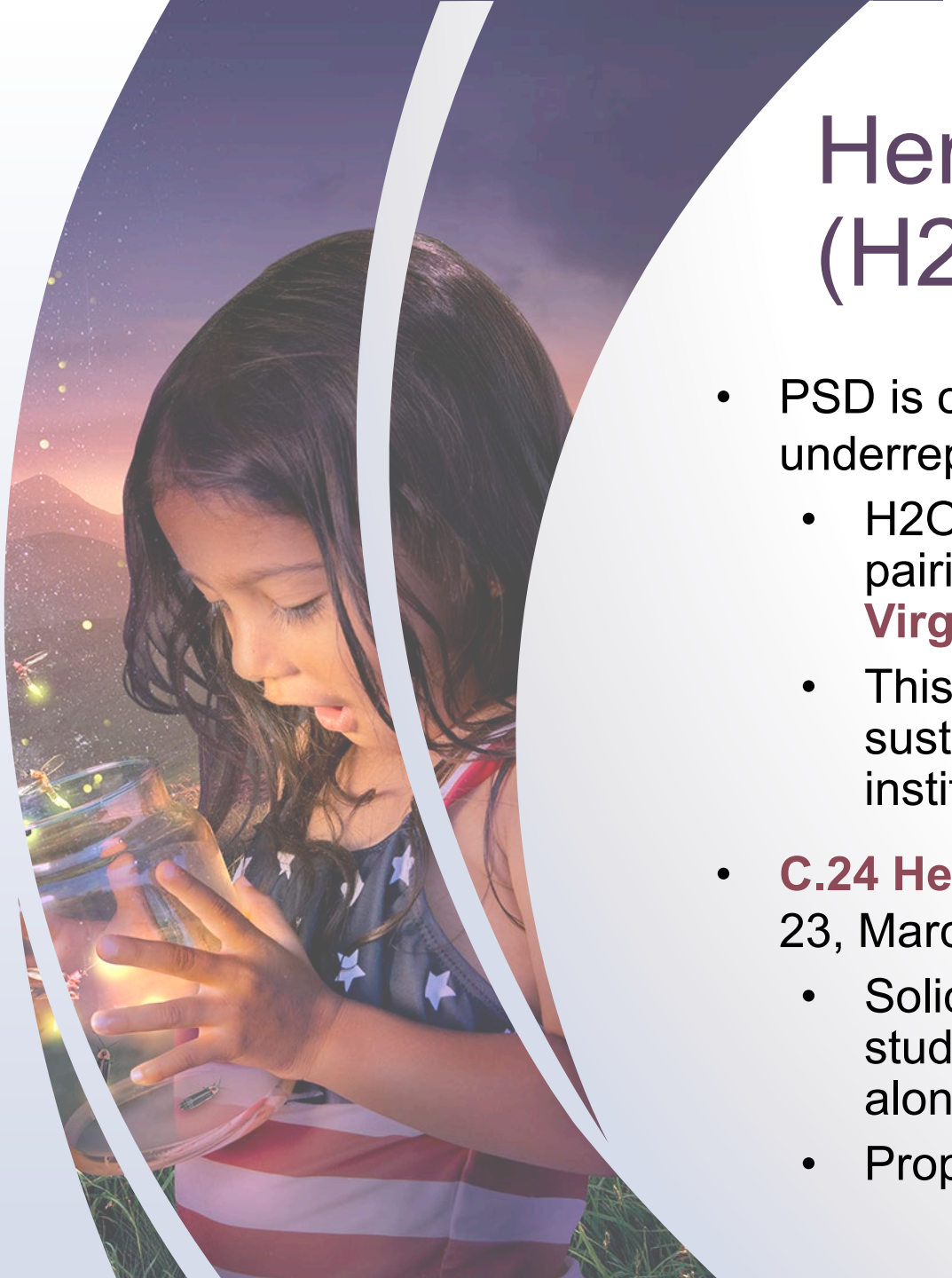
New Frontiers 5

- Draft AO released January 10, 2023: https://go.nasa.gov/NF5DraftAO
- Current planned schedule:
  - Target release of final AO: November 2023
  - Target proposal due date: March 2024
- Draft mission themes:
  - Comet Surface Sample Return
  - Io Observer
  - Lunar Geophysical Network
  - Lunar South Pole-Aitken Basin Sample Return
  - Ocean Worlds (only Enceladus)
  - Saturn Probe
- Sixth Community Announcement released March 21, 2023 regarding availability and readiness of RPS technologies
- Full information posted on New Frontiers Program Acquisition Page: https://newfrontiers.larc.nasa.gov/NF5/
- Questions and feedback may be emailed to Curt Niebur, New Frontiers Program Lead Scientist (curt.niebur@nasa.gov)

Decadal Survey Progress

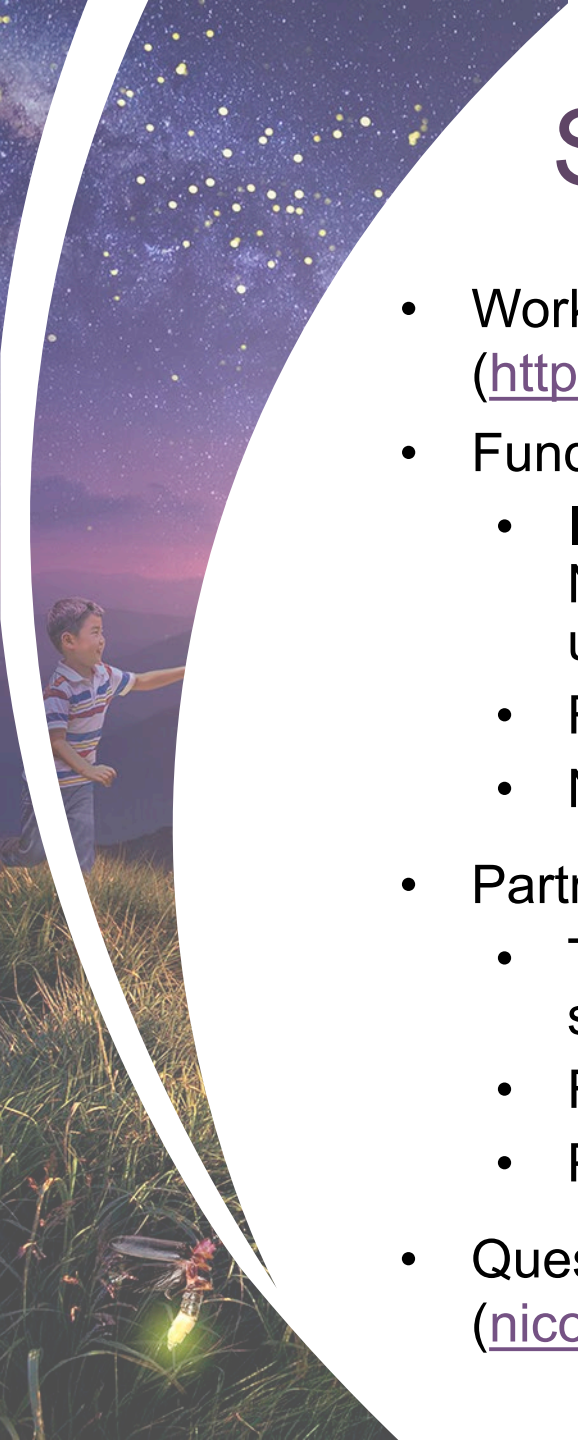
PI Launch Pad

- Third SMD PI Launch Pad Workshop will be held **July 24–27, 2023** at the University of Michigan, Ann Arbor
- For those interested in developing their first flight mission proposal
  - People with potentially intersecting marginalized identities are strongly encouraged to apply
  - 35 to 40 participants will be selected
  - No cost to attend the workshop
- Applications due April 14, 2023 (to be submitted via NSPIRES)
- More information: https://science.nasa.gov/researchers/pi-launchpad



Here to Observe (H2O)

- PSD is committed to sustaining and cultivating partnerships with underrepresented institutions, to improve outcomes in IDEA
  - H2O Program is in its second year with two MSI/Mission pairings: **University of Puerto Rico/Europa Clipper** and **Virginia State University/Dragonfly**
  - This second year will help scope a broader, reproducible, sustainable program for the future – to include more partner institutions and PSD missions
- **C.24 Here to Observe Program** solicitation released in ROSES-23, March 20 2023
  - Solicits proposals form non-R1 institutions for undergraduate students to observe PSD mission meetings/activities, alongside mentors and peers
  - Proposals may be submitted at any time (no due date)



SMD Bridge Program

- Workshop held October 2022 (https://www.hou.usra.edu/meetings/smdfall2022/)
- Funding to develop sustainable **partnerships** among:
  - Institutions that have been historically under-resourced by NASA (e.g., HBCUs, tribal colleges and universities, undergraduate-only institutions, community colleges, HSIs)
  - Research institutions
  - NASA Centers
- Partnerships should focus on:
  - Transitioning undergraduate students into STEM graduate schools and/or employment by NASA/related institutions
  - Faculty development
  - Paid undergraduate student positions
- Question/comments should be sent to Nicolle Zellner (nicolle.zellner@nasa.gov) or Padi Boyd (padi.boyd@nasa.gov)

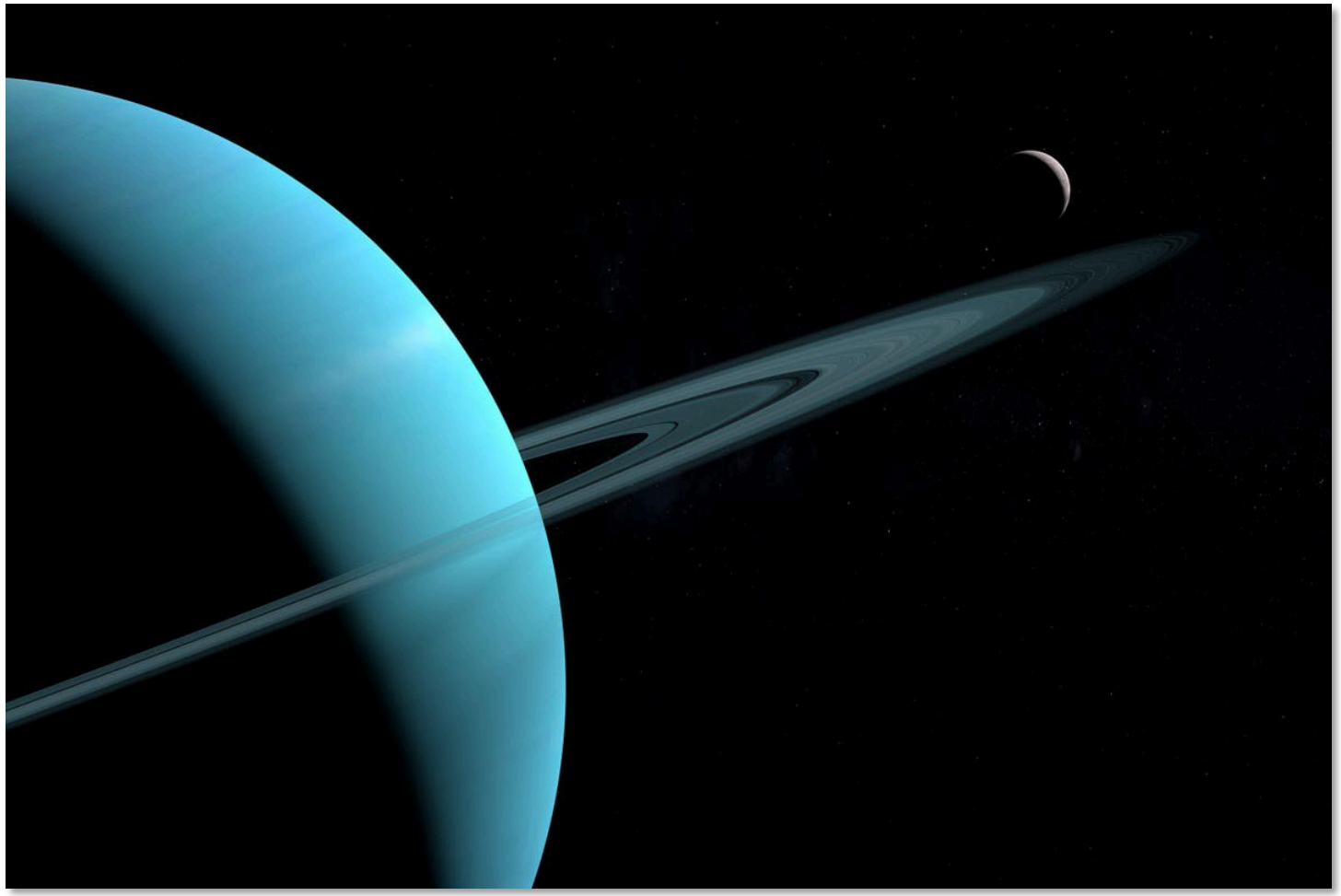
More information

NEO Surveyor

- Dedicated Planetary Defense Mission
- Space-based infra-red telescope designed for NEO detection, tracking, and characterization
- Mission Objectives:
  - Find 2/3 of Potentially Hazardous Asteroids >140 m in 5 years (goal: >90% in 10 years)
  - Characterize the frequency of impacts from asteroids >50 m and from comets
  - Provide capability to collect and verify additional observations, to derive improved orbital and physical characterizations of specific objects of interest
- KDP-C passed and entered Phase C November 2022
- FY23 Appropriation is $50M more than President's Request
  - Launch still delayed to NET 2028, but helps to keep project moving forward

Uranus Flagship Status

- Science and mission concept are well established, well studied, and strong
- Working on a plan for **limited technical studies** (rather than large STDT) and **early science team/payload selection**
  - Need NASA and other stakeholders on board before plan is public
- **Patience and flexibility!** This will be a long road



Near-term activities

- Prepare for FY25 budget this spring
- Trajectory studies for later launches and longer cruises
- Focus the broad trade space of payload scale and strategy

Moving the ball

Integrated Lunar Science Strategy

- PSD/ESSIO work continuing
- More information from Joel Kearns/Sarah Noble on Day 2 of CAPS

Future Mars Science Plan

- Draft plan to be shared with community soon
- More information from Eric Ianson on Day 2 of CAPS

Technology Development plan

- PESTO team working to create a new PSD Technology plan
- Plan will be responsive to OWL recommendations and findings, as well as to NASA's Strategic and Science Plans

Research and Analysis

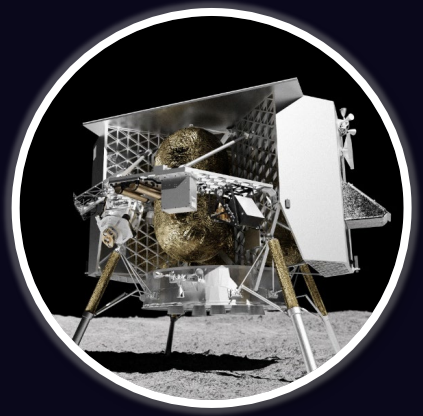
- FY24 PBR includes increased R&A budget to make progress towards Decadal recommendation of 10% R&A investment relative to PSD budget
- Proposal pressure was substantially down in ROSES-22

Astrobiology

- New SMD Astrobiology Senior Advisor position

Coming Up

Things to Watch



First CLPS launches

OSIRIS-REx sample return

Psyche launch

JUICE launch

Clipper ATLO

Discovery at 30


EXPLORE
With Us

Planetary Science Program Content ($M)

	Actual	Enacted	Request	Out-Years			
	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Planetary Science	**$3,120.4**	**$3,200.0**	**$3,383.2**	**$3,265.8**	**$3,246.1**	**$3,350.8**	**$3,389.7**
Planetary Science Research	$309.0		$307.4	$333.3	$352.0	$360.2	$386.4
Planetary Science Research and Analysis	*$221.3*		*$224.6*	*$249.3*	*$261.5*	*$267.4*	*$290.3*
Other Missions and Data Analysis	*$87.8*		*$82.8*	*$84.0*	*$90.5*	*$92.8*	*$96.2*
Advanced Multi-Mission Operation System	$40.5		$38.0	$38.0	$38.0	$37.7	$38.2
Planetary Data System	$27.3		$28.4	$28.6	$33.5	$35.7	$38.6
Astromaterial Curation	$16.0		$12.4	$12.4	$14.0	$14.4	$14.2
Robotics Alliance	$4.0		$4.0	$5.0	$5.0	$5.0	$5.1
Planetary Defense	$166.0		$250.7	$337.7	$400.5	$299.6	$79.0
NEO Surveyor	*$110.0*		*$209.7*	*$296.7*	*$358.5*	*$257.6*	*$39.0*
Other Missions and Data Analysis (operating)	*$56.0*		*$41.0*	*$41.0*	*$42.0*	*$42.0*	*$40.0*
Double Asteroid Redirection Test *(research and management)*	$13.8		$0.0	$0.0	$0.0	$0.0	$0.0
Near Earth Object Observations	$42.2		$41.0	$41.0	$42.0	$42.0	$40.0

Planetary Science Program Content ($M)

	Actual FY22	Enacted FY23	Request FY24	Out-Years FY25	FY26	FY27	FY28
Lunar Discovery and Exploration	$478.8		$458.5	$459.0	$460.5	$472.0	$483.3
VIPER	*$112.2*		*$61.3*	*$33.0*	*$0.0*	*$0.0*	*$0.0*
Other Missions and Data Analysis (development/formulation/technology)	*$366.5*		*$397.2*	*$426.0*	*$460.5*	*$472.0*	*$483.3*
Lunar Instruments	$24.1		$24.3	$57.3	$80.3	$83.8	$85.0
Commercial Lunar Payload Services	$244.3		$223.5	$224.1	$254.4	$254.5	$259.5
Lunar Intl Mission Collaborations	$0.0		$2.4	$0.5	$0.5	$0.5	$0.5
Lunar Trailblazer	$22.8		$4.3	$2.4	$0.0	$0.0	$0.0
Payloads and RI on Surface of Moon-1	$25.5		$9.1	$0.0	$0.0	$0.0	$0.0
Development and Advancement of Lunar Ins	$13.2		$10.0	$20.0	$15.0	$15.0	$15.3
Payloads and RI on Surface of the Moon-2	$0.0		$20.4	$6.2	$5.8	$0.0	$0.0
PRISM-3	$0.0		$25.0	$30.0	$5.0	$0.0	$0.0
Artemis Instruments	$0.0		$30.5	$31.3	$29.5	$31.0	$33.0
Lunar Future (operating)	$0.9		$3.9	$4.8	$19.7	$36.6	$37.9
Lunar Reconnaissance Orbiter (LRO) (research and management)	$22.1		$22.1	$22.1	$22.1	$22.1	$22.2
Lunar Management	$11.3		$5.2	$5.4	$5.5	$5.7	$5.6
Lunar Science	$2.2		$16.3	$21.7	$22.5	$22.8	$24.3
Mars Sample Return	$653.2		$949.3	$700.0	$600.0	$612.1	$627.6
Mars Sample Return	*$653.2*		*$949.3*	*$700.0*	*$600.0*	*$612.1*	*$627.6*

Planetary Science Program Content ($M)

	Actual FY22	Enacted FY23	Request FY24	Out-Years FY25	FY26	FY27	FY28
Discovery	$331.8		$247.5	$386.4	$426.0	$579.2	$625.9
DAVINCI	*$12.4*		*$55.8*	*$173.0*	*$201.2*	*$268.6*	*$213.0*
VERITAS	*$14.4*		*$1.5*	*$1.5*	*$1.5*	*$1.5*	*$1.5*
Psyche	*$163.8*		*$57.7*	*$34.5*	*$34.5*	*$37.1*	*$15.4*
Other Missions and Data Analysis (development/formulation/technology)	*$141.1*		*$132.5*	*$177.5*	*$188.8*	*$272.0*	*$396.0*
Mars-moon Exploration with GAmma Rays an	$2.9		$4.1	$3.8	$4.2	$1.6	$1.7
Planetary SmallSats	$1.6		$0.1	$7.5	$31.4	$40.0	$6.1
Venus Technology	$6.6		$7.0	$3.2	$1.7	$1.0	$1.0
Janus	$16.3		$0.0	$0.0	$0.0	$0.0	$0.0
EnVision	$17.8		$33.1	$47.1	$43.9	$46.6	$28.7
International Mission Contributions (IMC	$8.4		$6.8	$8.5	$10.3	$10.2	$8.6
Discovery Future	$4.5		$5.3	$28.3	$21.8	$82.4	$257.2
(operating)							
Strofio	$1.0		$1.0	$1.8	$1.2	$2.3	$2.4
InSight	$11.4		$0.0	$0.0	$0.0	$0.0	$0.0
Lucy	$44.6		$24.8	$25.9	$23.8	$34.8	$34.0
(research and management)							
Planetary Management	$18.3		$41.2	$41.2	$38.5	$40.0	$43.0
Discovery Research	$7.8		$9.2	$10.1	$12.1	$13.1	$13.4
New Frontiers	$283.7		$407.5	$447.8	$386.1	$367.3	$337.5
Dragonfly	*$219.1*		*$327.7*	*$355.5*	*$274.8*	*$207.7*	*$24.8*
Other Missions and Data Analysis (development/formulation/technology)	*$64.6*		*$79.9*	*$92.3*	*$111.3*	*$159.6*	*$312.7*
New Frontiers Future Missions	$0.5		$0.0	$35.6	$74.0	$128.0	$272.0

Planetary Science Program Content ($M)

	Actual FY22	Enacted FY23	Request FY24	FY25	Out-Years FY26	FY27	FY28
New Frontiers Cont.	$283.7		$407.5	$447.8	$386.1	$367.3	$337.5
(operating)							
Apophis Explorer	$0.0		$14.5	$15.8	$19.9	$22.1	$31.0
Origins Spectral Interpretation Resource	$12.5		$16.8	$5.4	$0.0	$0.0	$0.0
New Horizons	$9.5		$9.7	$0.0	$0.0	$0.0	$0.0
Juno	$31.8		$28.4	$26.2	$8.1	$0.0	$0.0
(research and management)							
New Frontiers Research	$10.4		$10.5	$9.3	$9.3	$9.5	$9.7
Mars Exploration	$265.0		$268.6	$279.2	$311.6	$315.3	$367.2
Other Missions and Data Analysis	*$265.0*		*$268.6*	*$279.2*	*$311.6*	*$315.3*	*$367.2*
(development/formulation/technology)							
Mars Organic Molecule Analyzer (MOMA)	$3.4		$0.2	$0.0	$0.0	$0.0	$0.0
Mars Future Missions	$6.9		$49.9	$68.5	$108.4	$118.8	$177.4
Mars Technology	$9.1		$3.0	$3.0	$3.0	$3.0	$3.0
(operating)							
Mars Rover 2020	$109.6		$85.0	$80.5	$82.0	$82.5	$83.0
Trace Gas Orbiter - ExoMars	$2.0		$2.0	$2.0	$2.0	$2.0	$2.0
2011 Mars Science Lab	$43.3		$40.5	$35.0	$30.0	$25.0	$20.0
Mars Reconnaissance Orbiter 2005 (MRO)	$24.4		$25.6	$25.4	$25.4	$25.4	$25.0
Mars Odyssey 2001	$10.6		$11.0	$6.2	$0.0	$0.0	$0.0
Mars Express	$0.0		$0.3	$0.3	$0.3	$0.3	$0.3
Mars Mission Operations	$6.7		$5.5	$5.5	$5.6	$5.4	$5.4
Mars Atmosphere & Volatile EvolutioN	$22.0		$23.0	$24.0	$24.0	$24.0	$22.0

Planetary Science Program Content ($M)

	Actual FY22	Enacted FY23	Request FY24	Out-Years FY25	FY26	FY27	FY28
Mars Exploration	$265.0		$268.6	$279.2	$311.6	$315.3	$367.2
(research and management)							
Mars Program Management	$11.8		$6.9	$13.2	$15.3	$13.3	$13.5
Mars Research and Analysis	$15.1		$15.7	$15.7	$15.7	$15.7	$15.7
Outer Planets and Ocean Worlds	$484.3		$318.4	$121.3	$134.8	$178.3	$321.9
Jupiter Europa	*$472.1*		*$303.3*	*$100.8*	*$80.6*	*$77.7*	*$84.0*
Europa Clipper	$472.1		$303.3	$100.8	$80.6	$77.7	$84.0
Other Missions and Data Analysis	*$12.2*		*$15.1*	*$20.6*	*$54.2*	*$100.6*	*$237.9*
(development/formulation/technology)							
Planetary Decadal Future	$0.0		$0.0	$3.0	$36.0	$82.4	$219.4
JUICE - Jupiter Icy Moons Explorer	$0.6		$2.4	$2.2	$2.8	$2.8	$2.9
Icy Satellites Surface Technology	$3.2		$0.0	$0.0	$0.0	$0.0	$0.0
(research and management)							
Outer Planets Research	$8.5		$12.7	$15.4	$15.4	$15.4	$15.5
Radioisotope Power	$148.6		$175.5	$201.1	$174.6	$166.8	$160.9
DOE Operations and Analysis	$90.3		$108.4	$122.7	$118.5	$127.2	$128.6
Radioisotope Power System	$58.3		$67.1	$78.4	$56.2	$39.6	$32.3