National Aeronautics and Space Administration

NASA

EXPLORE SCIENCE

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

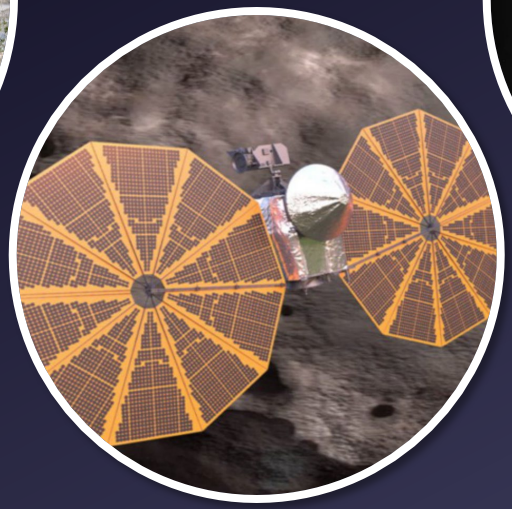
CAPS
October 24, 2023

Asteroid Autumn

OSIRIS-APEX start
September 24

Psyche Launch
October 13

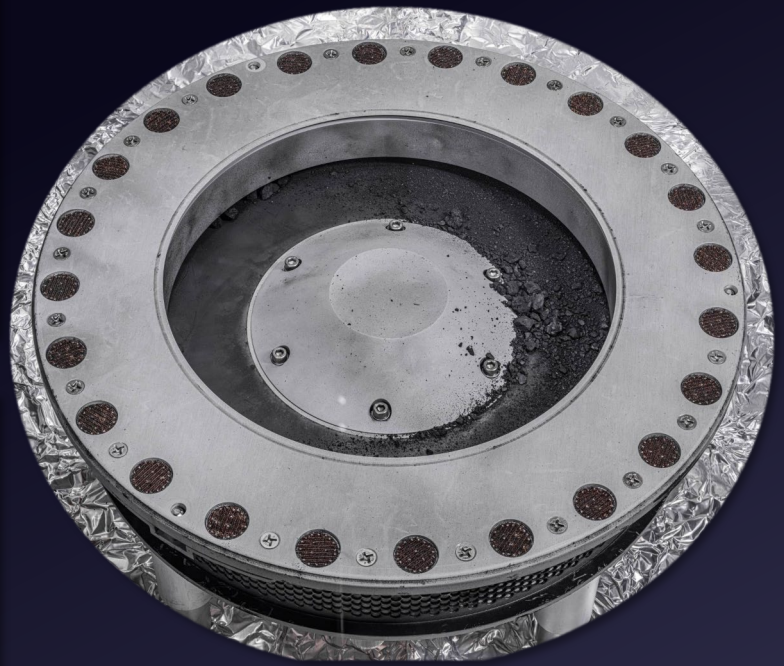
OSIRIS-REx Sample Return
September 24



First Lucy Asteroid Flyby
November 1

DART Impact
1-yr Anniversary
September 26

OSIRIS-REx



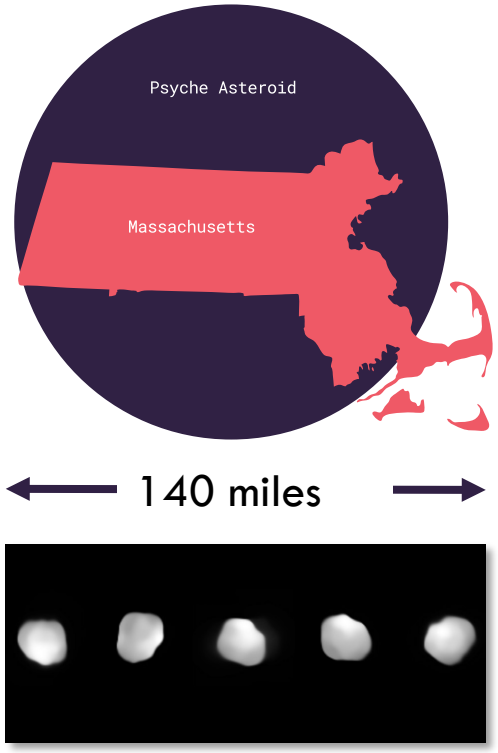
Psyche

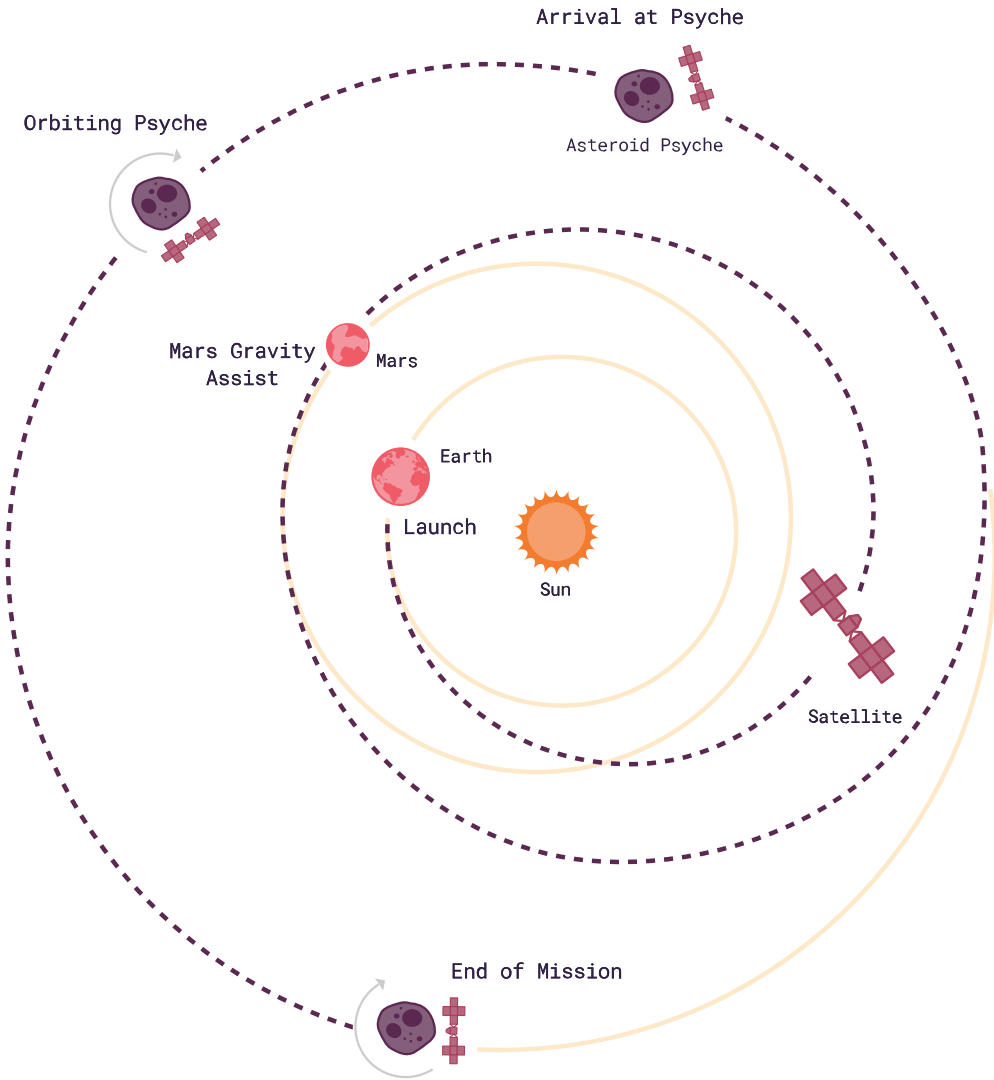
Timeline

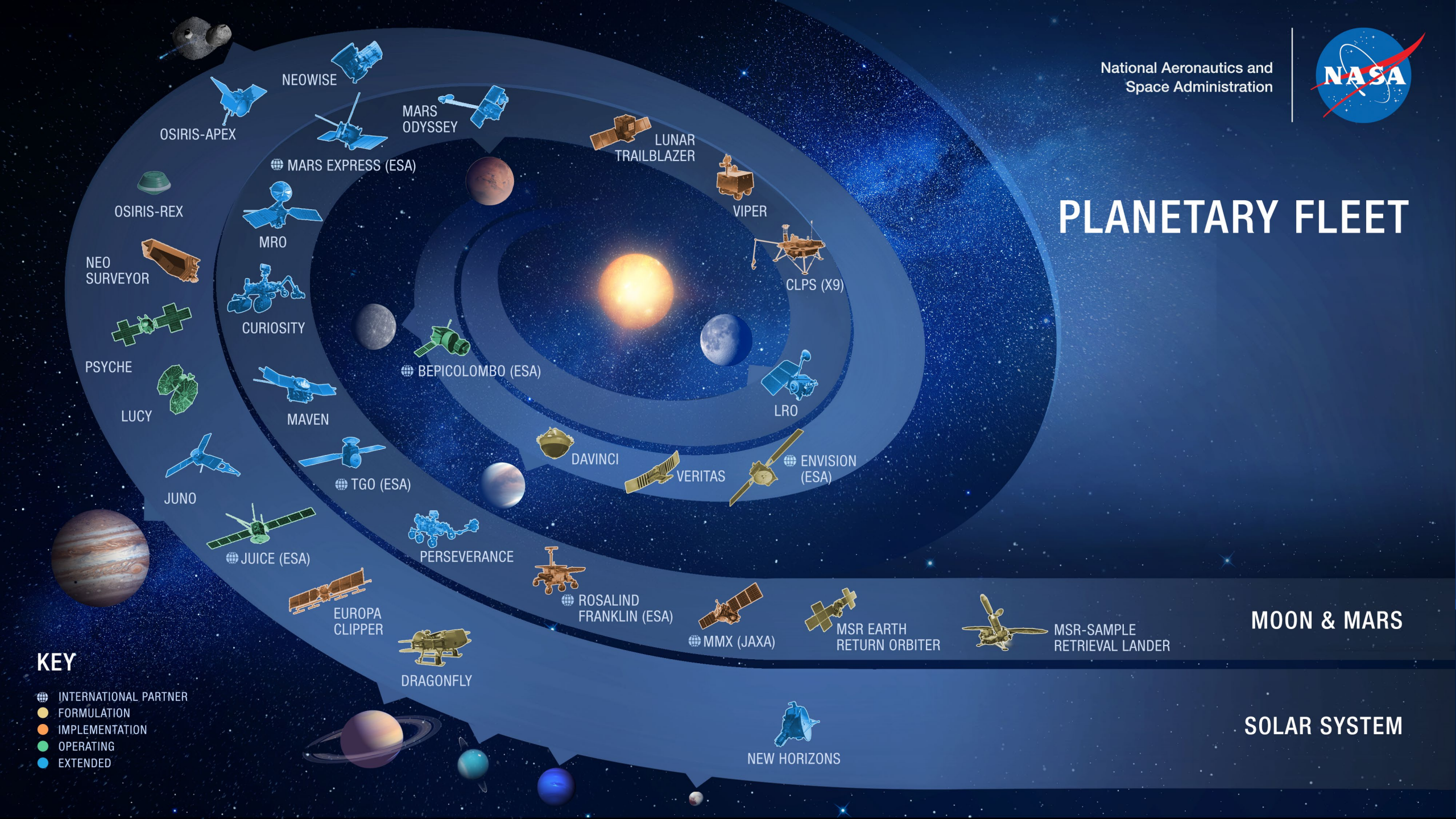
- Launched: October 13, 2023
- Mars flyby: March–May 2026
- Psyche Orbit Insertion: August 2029
  - Orbital mission: at least 26 months

Payload

- **Gamma-Ray and Neutron Spectrometer** (Johns Hopkins University Applied Physics Laboratory & Lawrence Livermore National Laboratory)
- **MultiSpectral Imager** (Malin Space Science Systems)
- **Magnetometer** (MIT)






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

PSD Personnel Updates

Charles Webb
PSD Associate Director, Flight Programs (Acting)

Delia Santiago-Materese
PSD Director of Research Programs (Acting)

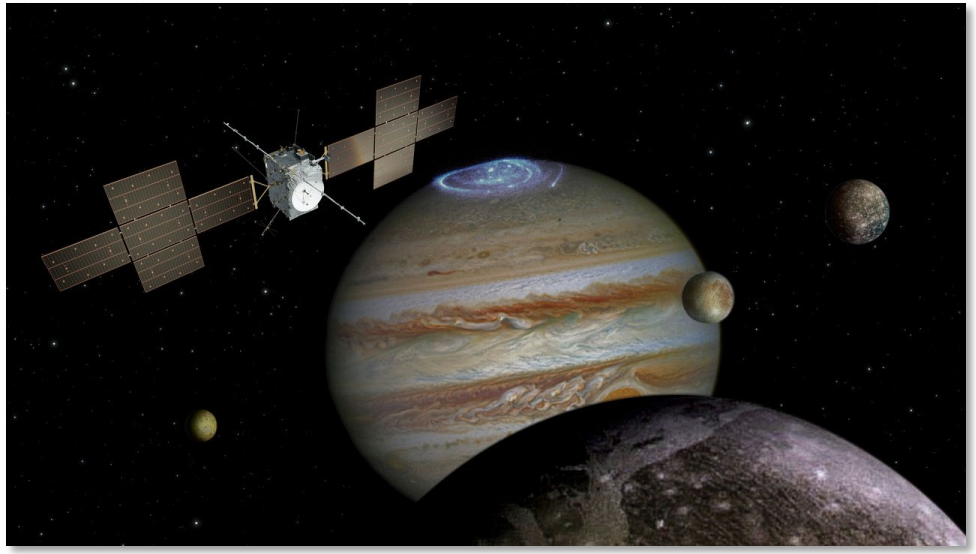
Robin Fergason
NASA Planetary Data Officer

David Grinspoon
Senior Scientist for Astrobiology Strategy

Kathleen Vander Kaaden
PSD Deputy Director of Research Programs (Acting)

Other Mission Updates

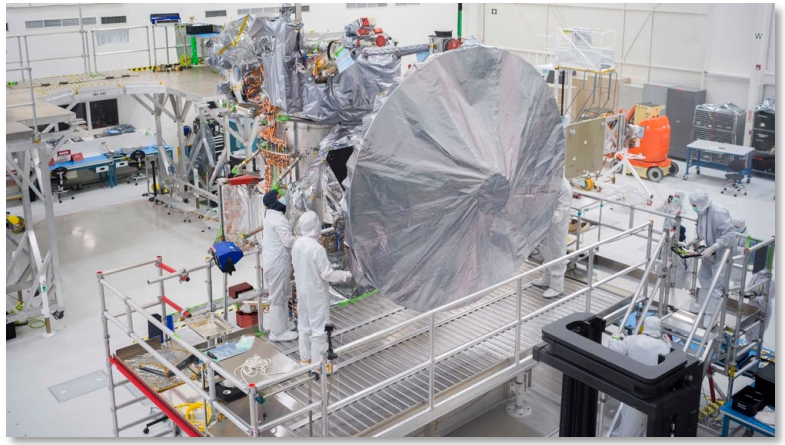
JUICE Launched!



Europa Clipper

- ATLO is continuing: live feed from High Bay
- Message in a Bottle campaign – send your name to Europa: go.nasa.gov/MessageInABottle
- All 10 instruments have been delivered and installed on spacecraft!
- Spacecraft is largely complete (with exception of solar arrays, which will be installed at KSC)
- Environmental testing of entire spacecraft begins in October
- Target launch: October 2024
- Jupiter Orbit Insertion: April 2030

Message in a bottle campaign



Installation of 10-ft high-gain antenna

Mars2020

Perseverance and Ingenuity, as of October 19

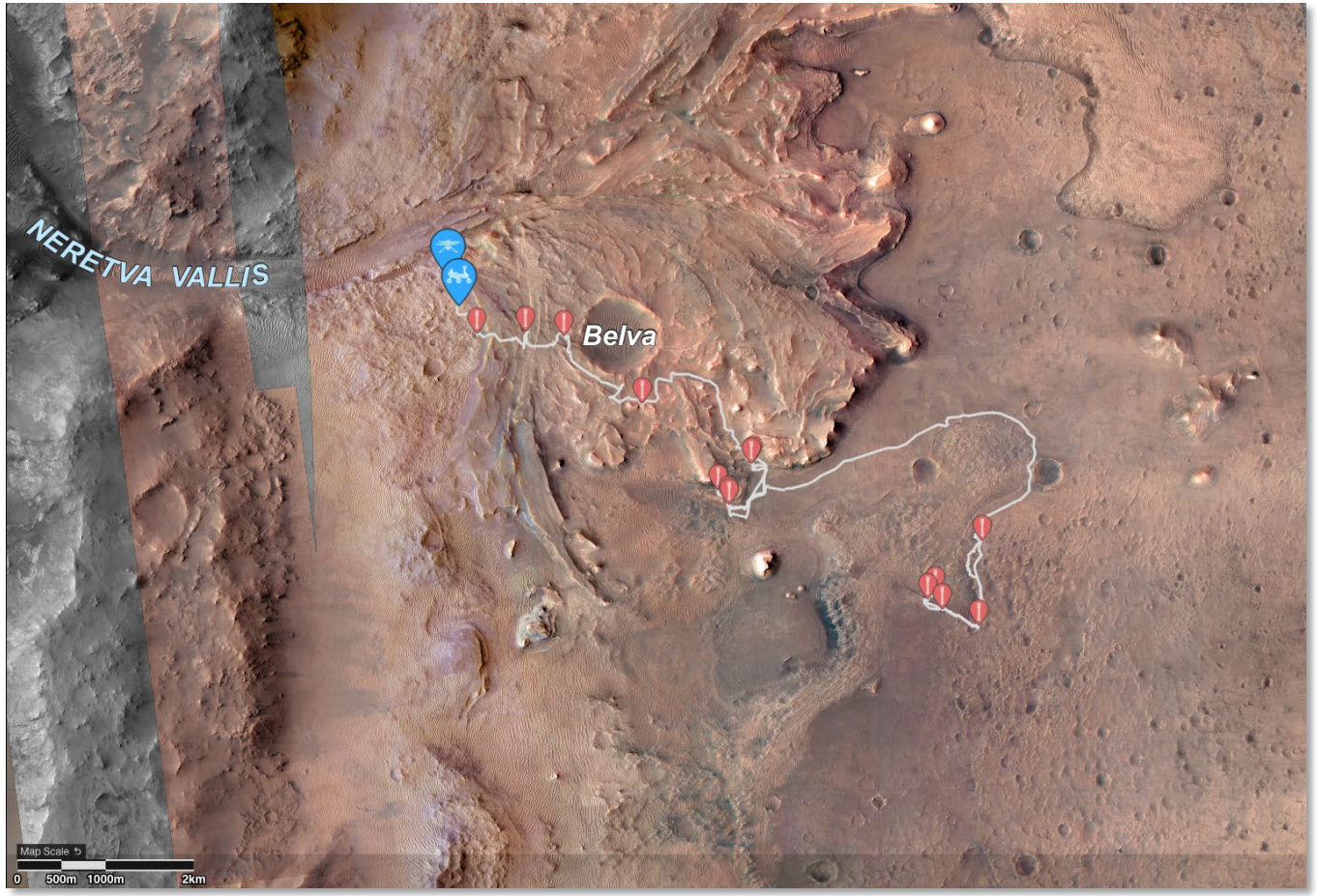
- Rover has traveled >21 km
- Ingenuity: completed 62 flights

Samples collected to date (26 of 43 tubes)

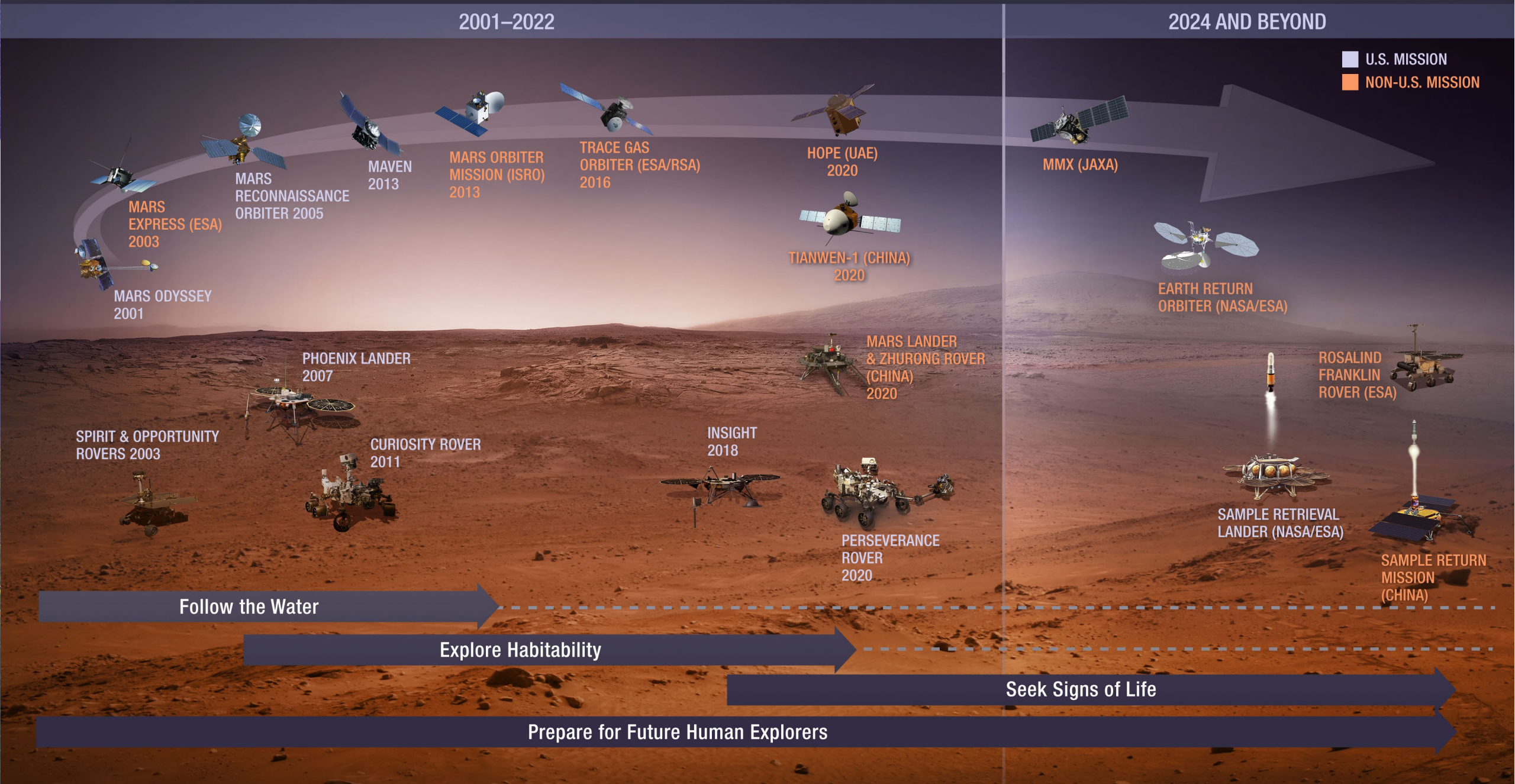
- 14 paired rock core samples:
  - 8 during Crater Floor Campaign
  - 6 during Delta Front Campaign
- Single samples:
  - 1 during Crater Floor Campaign
  - 5 during Upper Fan & Margin Unit Campaign
- 2 regolith samples
- 1 atmospheric sample
- 3 witness blank samples

Samples cached at Three Forks

- 10 tubes
  - 7 rock cores (4 igneous, 3 sedimentary)
  - 1 regolith sample
  - 1 atmospheric sample
  - 1 witness blank sample



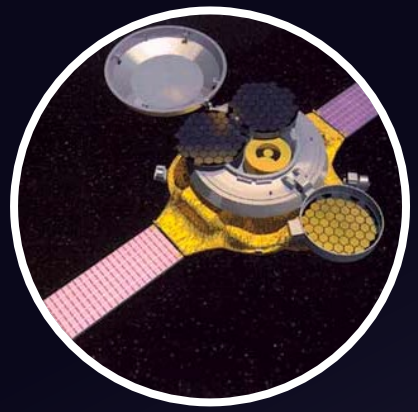
Full sample information available: https://mars.nasa.gov/mars-rock-samples/


2001–2022
2024 AND BEYOND
U.S. MISSION
NON-U.S. MISSION
MARS EXPRESS (ESA) 2003
MARS RECONNAISSANCE ORBITER 2005
MAVEN 2013
MARS ORBITER MISSION (ISRO) 2013
TRACE GAS ORBITER (ESA/RSA) 2016
HOPE (UAE) 2020
MMX (JAXA)
TIANWEN-1 (CHINA) 2020
MARS ODYSSEY 2001
EARTH RETURN ORBITER (NASA/ESA)
PHOENIX LANDER 2007
MARS LANDER & ZHURONG ROVER (CHINA) 2020
ROSALIND FRANKLIN ROVER (ESA)
SPIRIT & OPPORTUNITY ROVERS 2003
CURIOSITY ROVER 2011
INSIGHT 2018
SAMPLE RETRIEVAL LANDER (NASA/ESA)
PERSEVERANCE ROVER 2020
SAMPLE RETURN MISSION (CHINA)
Follow the Water
Explore Habitability
Seek Signs of Life
Prepare for Future Human Explorers

Sample Return: Multigenerational Gifts

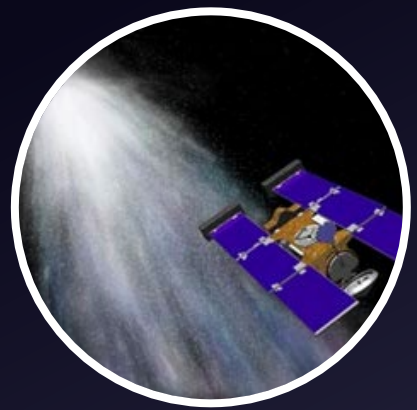
Apollo: Lunar Sample Return

Returned 1969– 1972



Genesis: Solar wind Sample Return

Landed 2004



Stardust: Comet Sample Return

Landed 2006

Hayabusa & Hayabusa2 (JAXA): Asteroid Sample Returns

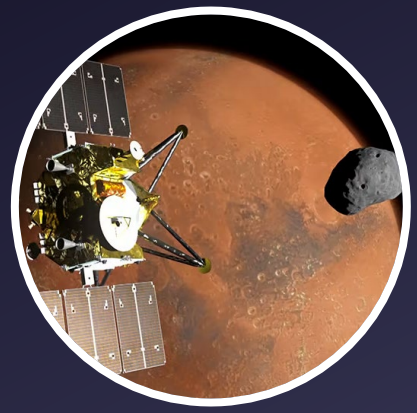
Landed 2010 & 2020

OSIRIS-REx: Asteroid Sample Return

Landed 2023

Artemis III+: Lunar Sample Returns

Landing 2025 and beyond



MMX (JAXA): Phobos Sample Return

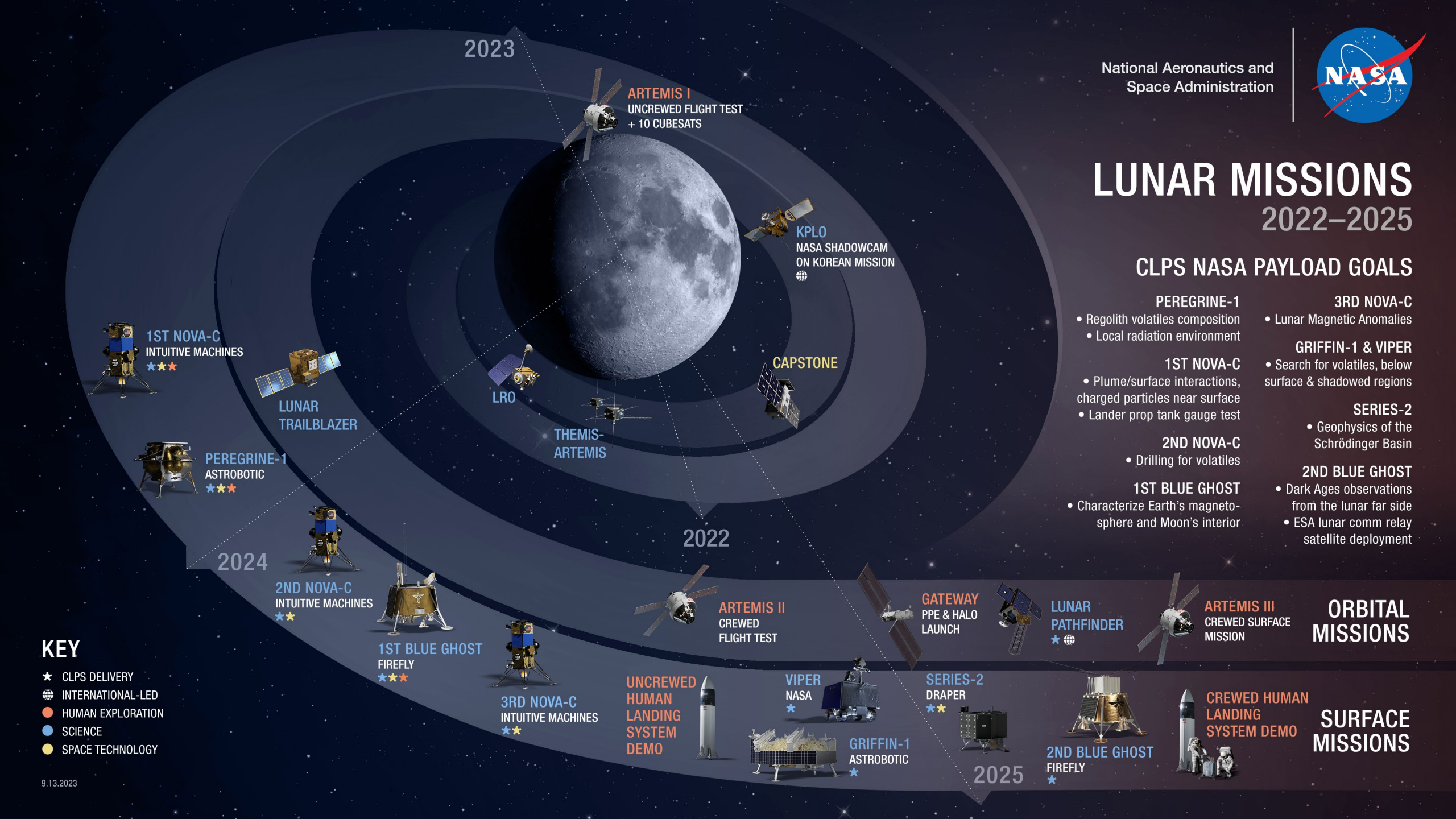
Landing 2029

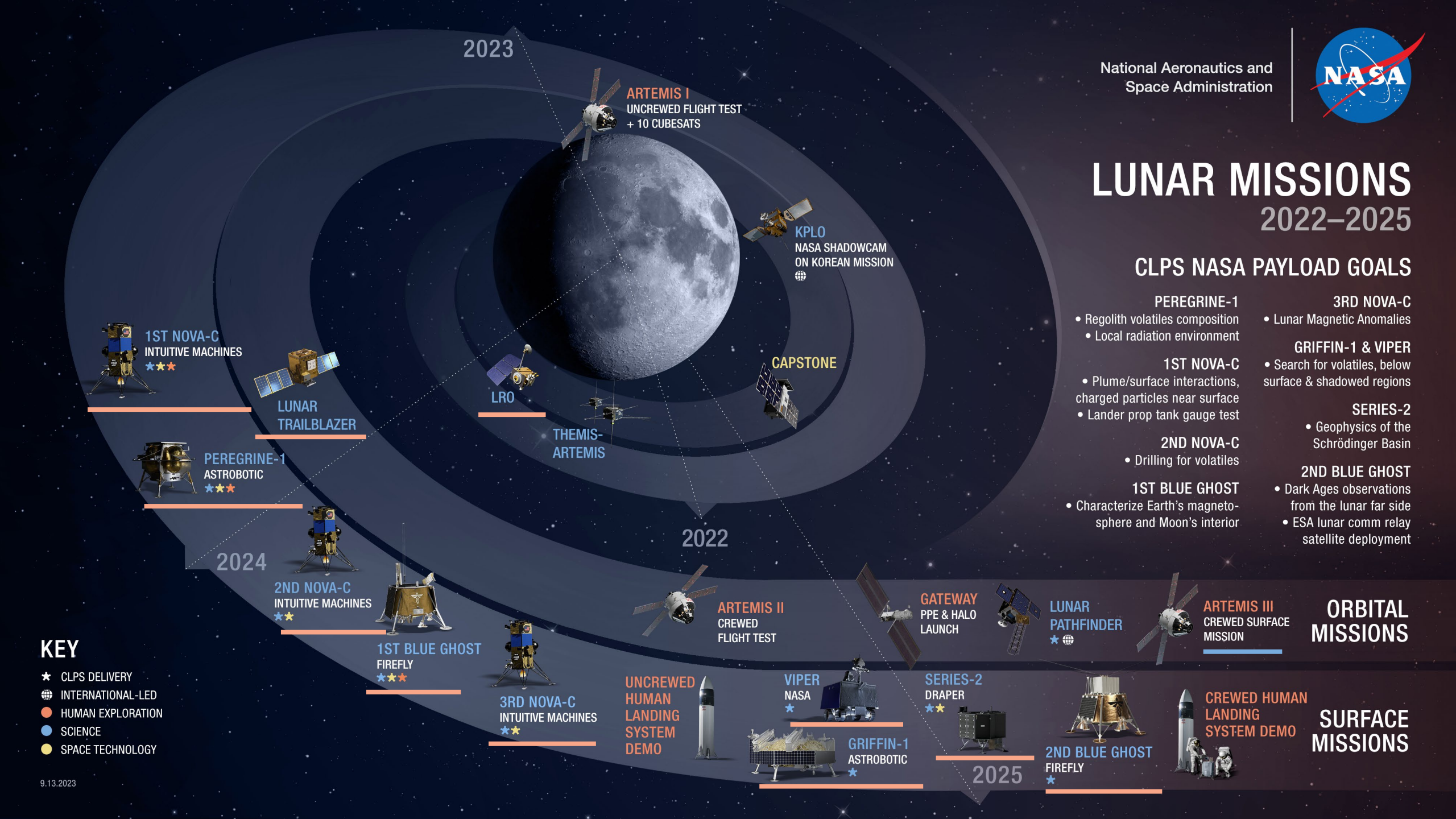
Mars Sample Return

Landing TBD

New Horizons

- SMD multi-panel review of New Horizons was held in 2022, led by Planetary Science Mission Senior Review (PSMSR) process
  - Demonstrated excellent science value that New Horizons could bring as a heliophysics mission
- Updated plan for exploration of the outer solar system with New Horizons:
  - Beginning in FY25: spacecraft will focus on gathering unique heliophysics data during a low-activity mode of operations
  - Possibility for spacecraft to be used for a future close flyby of any newly discovered, reachable Kuiper Belt object
  - Extended operations will continue until spacecraft exists Kuiper Belt (expected 2028 through 2029)
- New extended mission will be primarily funded by PSD
  - Jointly managed by HPD and PSD
  - Mission's budget needs and impact on PSD portfolio will be assessed during annual budget process this spring


National Aeronautics and Space Administration
NASA
LUNAR MISSIONS
2022–2025
CLPS NASA PAYLOAD GOALS
PEREGRINE-1
• Regolith volatiles composition
• Local radiation environment
1ST NOVA-C
• Plume/surface interactions, charged particles near surface
• Lander prop tank gauge test
2ND NOVA-C
• Drilling for volatiles
1ST BLUE GHOST
• Characterize Earth's magneto-sphere and Moon's interior
3RD NOVA-C
• Lunar Magnetic Anomalies
GRIFFIN-1 & VIPER
• Search for volatiles, below surface & shadowed regions
SERIES-2
• Geophysics of the Schrödinger Basin
2ND BLUE GHOST
• Dark Ages observations from the lunar far side
• ESA lunar comm relay satellite deployment
2023
ARTEMIS I
UNCREWED FLIGHT TEST
+ 10 CUBESATS
KPLO
NASA SHADOWCAM
ON KOREAN MISSION
CAPSTONE
LRO
THEMIS-ARTEMIS
LUNAR TRAILBLAZER
1ST NOVA-C
INTUITIVE MACHINES
PEREGRINE-1
ASTROBOTIC
2024
2ND NOVA-C
INTUITIVE MACHINES
1ST BLUE GHOST
FIREFLY
3RD NOVA-C
INTUITIVE MACHINES
2022
ARTEMIS II
CREWED
FLIGHT TEST
GATEWAY
PPE & HALO
LAUNCH
LUNAR PATHFINDER
ARTEMIS III
CREWED SURFACE
MISSION
ORBITAL MISSIONS
UNCREWED HUMAN LANDING SYSTEM DEMO
VIPER
NASA
GRIFFIN-1
ASTROBOTIC
SERIES-2
DRAPER
2025
2ND BLUE GHOST
FIREFLY
CREWED HUMAN LANDING SYSTEM DEMO
SURFACE MISSIONS
KEY
CLPS DELIVERY
INTERNATIONAL-LED
HUMAN EXPLORATION
SCIENCE
SPACE TECHNOLOGY
9.13.2023



CLPS NASA PAYLOAD GOALS

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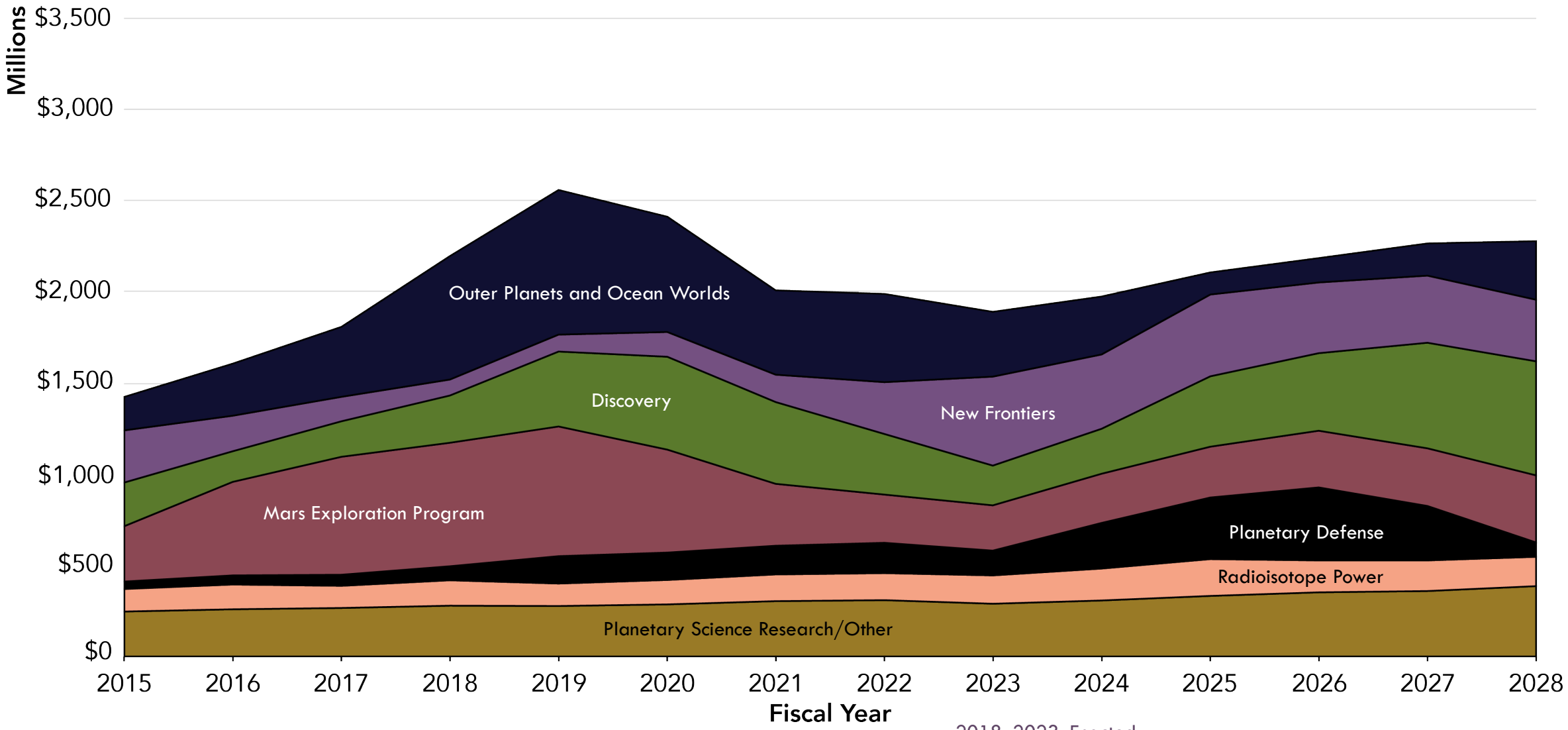
- Search for volatiles, below surface & shadowed regions

SERIES-2
- Geophysics of the Schrödinger Basin

2ND BLUE GHOST
- Dark Ages observations from the lunar far side
- ESA lunar comm relay satellite deployment

Challenges

PSD Budget 2015–2028 (data in backup)



2018–2023: Enacted
2024–2028: From President's Budget Request (PBR)

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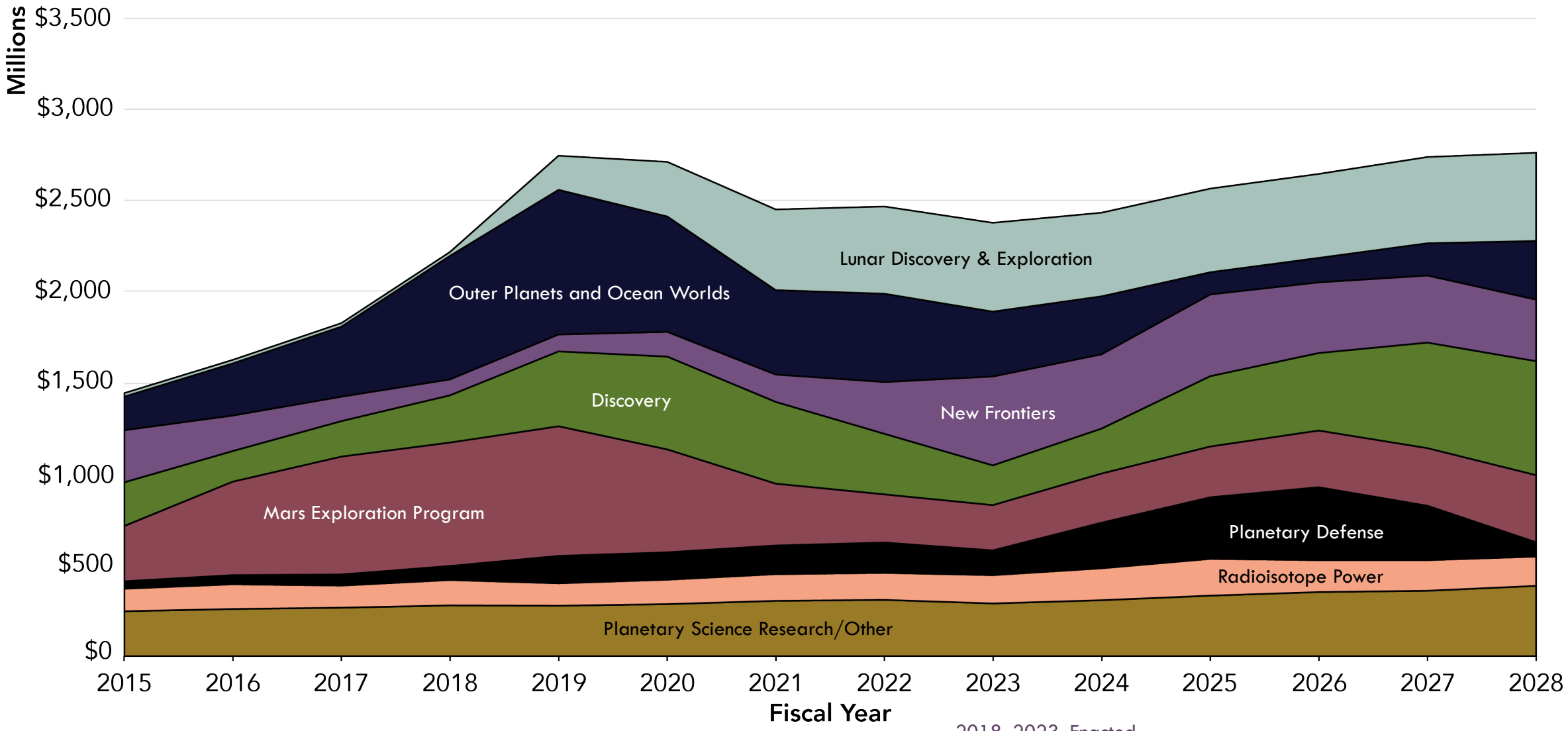

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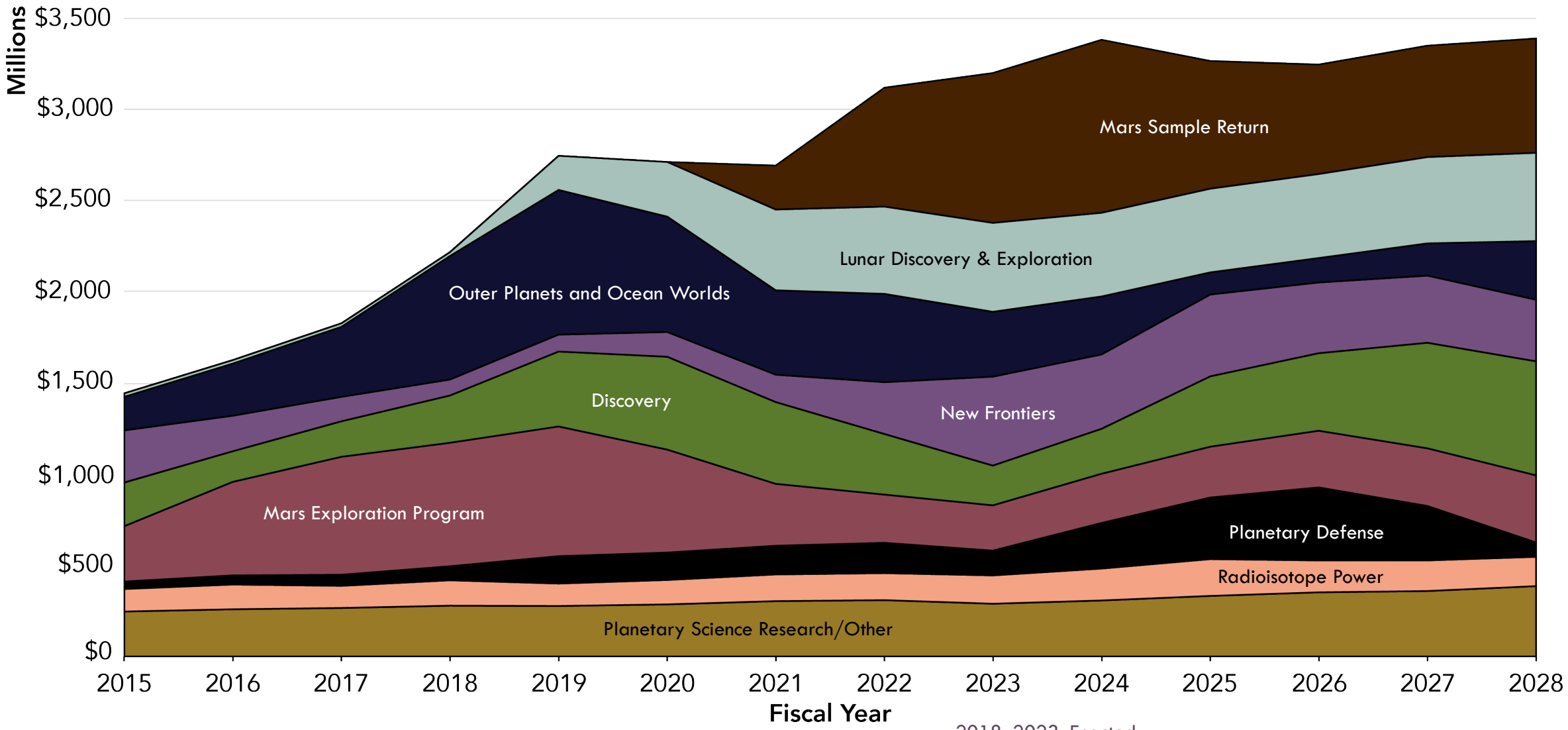


2018–2023: Enacted
2024–2028: From President's Budget Request (PBR)

Unanticipated Challenges – Need to Balance Commitments

- Direct COVID impact: work inefficiencies necessitating limited in-person work on missions in development (peak workforce)
- Supply Chain: higher costs for manufacturing and significantly longer lead times (funding required in earlier years)
- Inflation: significant rate changes for workforce at all institutions
- Psyche one-year launch delay
- Anticipated belt tightening over the next two years

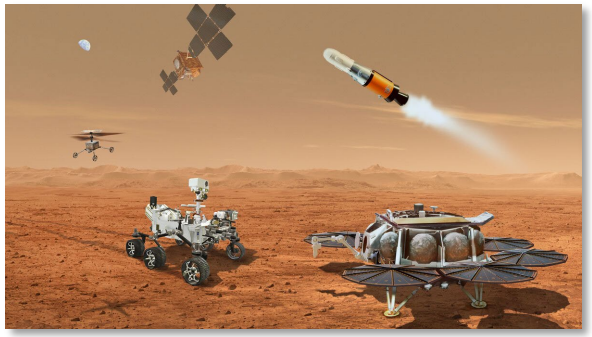
Specific Challenges

Mars Sample Return

Independent Review Board established May 2023 to evaluate technical, cost, and schedule plans prior to mission confirmation

- Report published online: https://www.nasa.gov/wp-content/uploads/2023/09/mars-sample-return-independent-review-board-report.pdf

- Team, led by Sandra Connelly (Deputy Associate Administrator for Science), will review report and make recommendations by Q2 of FY2024
- Plans to confirm official mission cost and schedule will be delayed until completion of the review



Dragonfly

- Preliminary design and technology maturation are complete
  - Successfully passed all technical requirements for mission PDR in March 2023
  - Preparation for NASA confirmation review later this year

Tightening budgets

- Working through the budget process

Future Mission AOs

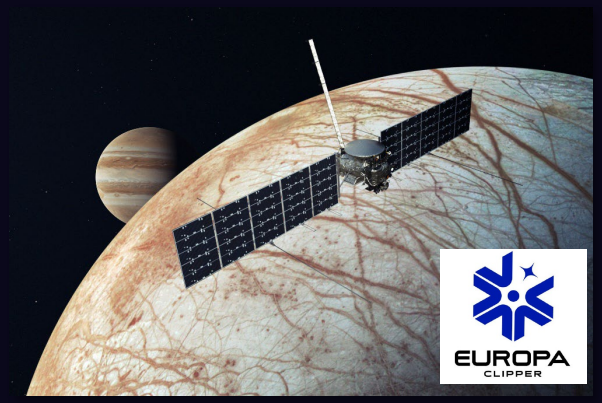
- Next New Frontiers (NF) AO final release will be no earlier than 2026
  - NF5 Community Announcement released in August provides more details
  - If the delay is significant NASA will ask CAPS to discuss mission theme recommendations (considering lists for NF5 and NF6)
- Unlikely to be solicitations for Discovery or SIMPLEx in the next two years


Community

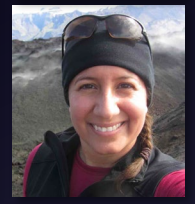
Research Programs

- Support for Planetary Science with Samples Cooperative Agreement Notice (CAN) – award made to USRA (LPI)
- Proposal submission rates continue to be below historical numbers
  - Some evidence for the start of an uptick
- No Due Date (NoDD) programs – evaluation is underway
- New SMD Scientific Information Policy (SPD-41a) sets requirements for how SMD-funded scientific information must be shared
  - SMD Open Science Guidelines
  - PSD supplement to SPD-41a now available – feedback welcome
- **Here to Observe (H2O) Program** solicitation released in ROSES-23 (C.24)
  - Solicits proposals from 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)

Here to Observe (H2O) Program – New Partners!

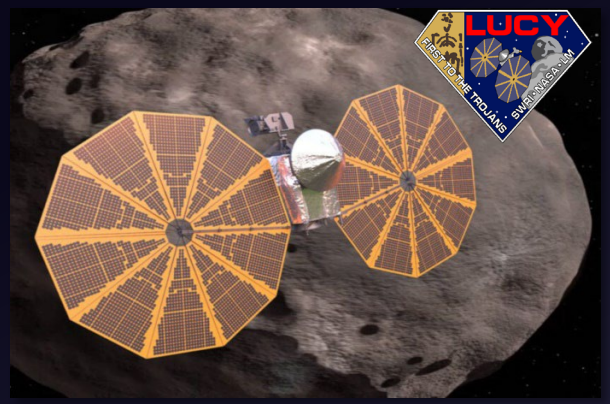


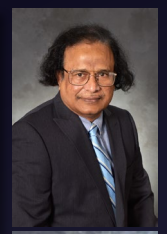

Ohio & Puerto Rico Space Grant Consortia
Robert Romero (Ohio Aerospace Institute)
Prof. Gerardo Morell (U. of Puerto Rico)
Dr. Rachel Klima (Europa Clipper Mission Liaison)

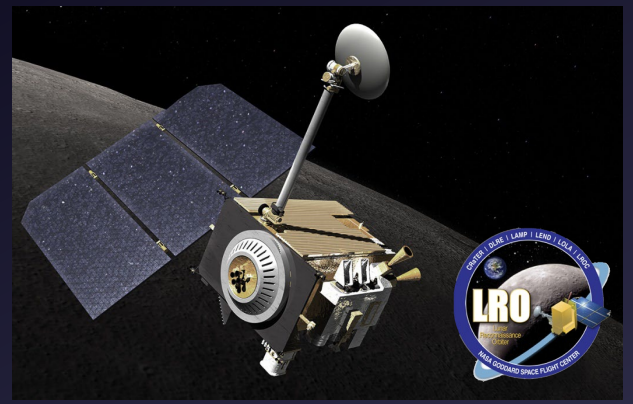
Kingsborough Community College
Prof. Steven Jaret (KBCC)
Dr. Alexandra Pontefract (Dragonfly Mission Liaison)


New Mexico State University
Prof. Nancy Chanover (NMSU)
Dr. Erika Kohler (DAVINCI Mission Liaison)






Univ. of Arkansas at Pine Bluff
Prof. Miah Adel (UAPB)
Dr. Katherine Kretke (Lucy Mission Liaison)




New Mexico Institute of Mining & Technology
Prof. Raúl Morales-Juberías (NMT)
John Van Eepoel (LRO Mission Liaison)


Virginia State University
Prof. Dawit Haile (VSU)
Dr. Ashwin Vasavada (Curiosity Mission Liaison)

PSD Early Career Award 2022 Winners!

Michael Sori (Purdue)
Enabling the future of planetary geodesy

Jamie Molaro (Planetary Science Institute)
Efficacy of thermally driven regolith creep on lunar, martian, and asteroid surfaces

David Welch (Columbia University)
Development of an inexpensive UV spectrometer for science education

Xinting Yu (University of Texas, San Antonio)
The next-generation laboratory experiments on planetary materials

Lynnae Quick (GSFC)
An HBCU pilot program to diversify the planetary science pipeline

Decadal Survey Progress

Maintaining Balance

Decadal survey lays out:

- **Level program** (assuming 2% annual increase)
- **Recommended program** (additional 17.5% budget increase)
- **Budgetary Decision Rules** (should program budget be reduced below level program)

Reductions beyond Decadal Survey rules may be required if anticipated budgets are realized – following this strategy:

- Consider the Decadal budgetary decision rules and suggested descopes carefully
  - Does little to offset funding needs in very near term
- Postpone new initiatives (Uranus Orbiter & Probe; other competed mission programs) – **biggest lever**
- Protect R&A budget
- Prioritize missions in development (with Agency commitment to cost and schedule), in order of launch date
- Minimize disruption to international partnerships
- Try to maintain balance between operating missions and those in development
- Try to maintain balance between competed and directed missions

Preliminary Plans for Decadal-Recommended Missions

	Decadal Recommendation	NASA Current Plans
Discovery	• 5 new starts (Recommended program) • 4 new starts (Descope 1) • 3 new starts (Descope 2) • Increase cost cap to $800M	• Discovery 19 AO resulted in selection of DAVINCI and VERITAS • Next Discovery AO likely delayed to NET FY26
New Frontiers	• 2 new starts (Recommended program) • 1 new start (Descope 1) • Increase cost cap to $1.65B	• Dragonfly selection announced June 2019; • New Frontiers 5 (NF5) delayed to NET 2026; considering CAPS review of NF5 and NF6 targets for next AO
Flagship Missions	In priority order: • Uranus Orbiter and Probe (UOP) • Enceladus Orbi-lander	New start for recommended Flagship delayed
Mars	Mars Life Explorer	Delayed
Lunar Exploration	Endurance-A	Under study
Planetary Defense	Rapid-response, flyby reconnaissance mission targeted to a challenging NEO	Delayed
Ongoing Missions	• Continue missions in development, and missions in flight subject to senior review • Early planning to provide adequate funding of mission extensions, particularly for flagship missions and mission with international partners	• Psyche launched early October 2023 • Strategic missions (Europa Clipper, VIPER, and NEO Surveyor) are on track • Support for extended missions

Other Decadal Survey Progress

Integrated Lunar Science Strategy

- PSD/ESSIO work continuing
- Release of draft document for community comment: Fall 2023

Future Mars Science Plan

- Draft is in circulation with the community

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

Astrobiology

- New Senior Scientist for Astrobiology Strategy now in role (David Grinspoon)


Looking Up and
On


EXPLORE
With Us

PSD Budget 2015–2028

2018–2023: Enacted
2024–2028: From President's Budget Request (PBR)

Program (in Millions)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Planetary Science	*$1,444*	*$1,626*	*$1,828*	*$2,218*	*$2,747*	*$2,713*	*$2,693*	*$3,120*	*$3,200*	*$3,383*	*$3,266*	*$3,246*	*$3.351*	*$3,390*
Mars Sample Return	-	-	-	-	-	-	**$241.6**	**$653.2**	**$822.3**	**$949.3**	**$700.0**	**$600.0**	**$612.1**	**$627.6**
Mars Sample Return	-	-	-	-	-	-	$241.6	$653.2	$822.3	$949.3	$700.0	$600.0	$612.1	$627.6
Lunar Discovery & Exploration	**$19.9**	**$19.0**	**$19.0**	**$22.0**	**$188.0**	**$300.0**	**$443.5**	**$478.8**	**$486.2**	**$458.5**	**$459.0**	**$460.5**	**$472.0**	**$483.3**
VIPER	-	-	-	-	$39.7	$54.9	$99.1	$112.2	$97.2	$61.3	$33.0	-	-	-
Lunar Instruments	-	-	-	$2.0	$55.2	$34.1	$17.1	$23.6	$21.3	$24.3	$57.3	$80.3	$83.8	$85.0
CLPS	-	-	-	-	$69.1	$184.6	$233.4	$244.3	$242.3	$223.5	$224.1	$254.4	$254.5	$259.5
Lunar Int'l Mission Collaborations	-	-	-	-	$0.2	<$0.0	$0.7	$0.0	$0.1	$2.4	$0.5	$0.5	$0.5	$0.5
Lunar Trailblazer	-	-	-	-	-	-	$23.2	$22.8	$11.2	$4.3	$2.4	-	-	-
PRISM-1	-	-	-	-	-	-	$21.0	$26.5	$23.0	$9.1	-	-	-	-
DALI	-	-	-	-	-	-	$20.5	$13.2	$14.5	$10.0	$20.0	$15.0	$15.0	$15.3
PRISM-2	-	-	-	-	-	-	-	<$0.0	$25.3	$20.4	$6.2	$5.8	-	-
PRISM-3	-	-	-	-	-	-	-	-	-	$25.0	$30.0	$5.0	-	-
Artemis Instruments	-	-	-	-	-	-	-	-	$12.0	$30.5	$31.3	$29.5	$31.0	$33.0
Lunar Future	-	-	-	-	$1.8	$4.3	$2.8	$0.9	$5.0	$3.9	$4.8	$19.7	$36.6	$37.9
LRO	$19.9	$19.0	$19.0	$20.0	$22.0	$22.0	$22.2	$22.1	$22.1	$22.1	$22.1	$22.1	$22.1	$22.2
Lunar Management	-	-	-	-	-	-	$3.5	$10.9	$5.5	$5.2	$5.4	$5.5	$5.7	$5.6
Lunar Science	-	-	-	-	-	-	-	$2.2	$6.7	$16.3	$21.7	$22.5	$22.8	$24.3

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2018–2023: Enacted
2024–2028: From President's Budget Request (PBR)

Program (in Millions)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Outer Planets & Ocean Worlds	**$183.9**	**$285.8**	**$384.5**	**$676.2**	**$793.6**	**$632.0**	**$461.5**	**$484.3**	**$356.8**	**$318.4**	**$121.3**	**$134.8**	**$178.3**	**$321.9**
Cassini	$68.1	$58.8	$54.1	$19.2	$3.9	-	-	-	-	-	-	-	-	-
JUICE	$7.3	$18.7	$22.9	$18.5	$15.6	$18.2	$4.4	$0.6	$1.7	$2.4	$2.2	$2.8	$2.8	$2.9
Europa Clipper	$100.0	$149.4	$237.4	$525.0	$545.0	$592.6	$434.8	$472.1	$345.0	$303.3	$100.7	$80.6	$77.7	$84.0
Europa Lander	-	$25.6	$37.6	$70.0	$187.4	-	-	-	-	-	-	-	-	-
Icy Satellites Surface Technology	-	$24.9	$25.0	$35.0	$35.0	$14.2	$14.2	$3.2	-	-	-	-	-	-
Planetary Decadal Future	-	-	-	-	-	-	-	-	-	-	$3.0	$36.0	$82.4	$219.4
Outer Planets Research	$8.4	$8.5	$7.5	$8.5	$6.7	$7.0	$8.1	$8.5	$10.1	$12.7	$15.4	$15.4	$15.4	$15.5
New Frontiers	**$285.8**	**$194.0**	**$134.0**	**$88.1**	**$93.0**	**$136.8**	**$150.9**	**$283.7**	**$488.2**	**$407.5**	**$447.8**	**$386.1**	**$367.2**	**$337.5**
New Horizons	$28.8	$21.5	$29.4	$12.0	12.7	$17.3	$12.5	$9.5	$10.4	$9.7	-	-	-	-
Juno	$35.4	$45.8	$61.9	$17.8	$11.8	$33.8	$35.0	$31.8	$30.5	$28.4	$26.2	$8.1	-	-
OSIRIS-REx	$209.8	$124.7	$39.5	$42.8	$50.3	$37.1	$10.4	$12.5	$30.7	$16.8	$5.4	-	-	-
Dragonfly	-	-	-	-	$8.0	$41.0	$86.0	$219.1	$400.1	$327.7	$355.5	$274.8	$207.7	$24.8
Apophis Explorer	-	-	-	-	-	-	-	-	$5.0	$14.5	$15.8	$19.9	$22.1	$31.0
New Frontiers Future Missions	$11.9	$2.0	$1.6	$13.4	$2.3	$1.7	$2.2	$0.5	$0.9	$0.0	$35.6	$74.0	$128.0	$272.0
New Frontiers Research	-	-	$1.6	$2.1	$7.9	$5.9	$4.9	$10.4	$10.5	$10.5	$9.3	$9.4	$9.5	$9.7

PSD Budget 2015–2028

2018–2023: Enacted
2024–2028: From President's Budget Request (PBR)

Program (in Millions)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Discovery	**$239.0**	**$169.1**	**$194.6**	**$258.3**	**$409.5**	**$508.7**	**$447.7**	**$331.8**	**$217.5**	**$247.5**	**$386.4**	**$426.0**	**$579.2**	**$625.9**
Dawn	$17.2	$22.2	$1.0	$11.1	$0.2	-	-	-	-	-	-	-	-	-
DAVINCI	-	-	-	-	-	-	$4.1	$12.4	$20.2	$55.8	$173.0	$201.2	$268.7	$213.0
VERITAS	-	-	-	-	-	-	$6.5	$14.4	$9.5	$1.5	$1.5	$1.5	$1.5	$1.5
Psyche	-	-	$47.3	$42.0	$174.2	$214.0	$175.6	$163.8	$109.3	$57.7	$34.5	$34.5	$37.1	$15.4
MEGANE	-	-	-	$0.7	$3.9	$8.1	$12.2	$2.9	$4.3	$4.1	$3.8	$4.2	$1.6	$1.7
Planetary SmallSats	-	-	-	-	$4.4	$15.6	$4.8	$1.6	$1.3	$0.1	$7.5	$31.4	$40.0	$6.1
Venus Technology	-	-	-	-	-	-	$4.9	$6.6	$6.0	$7.0	$3.2	$1.7	$1.0	$1.0
Janus	-	-	-	-	-	-	$23.7	$16.3	$1.2	-	-	-	-	-
EnVision	-	-	-	-	-	-	$3.9	$17.8	$2.1	$33.1	$47.1	$43.9	$46.6	$28.7
Int'l Mission Contributions	$1.9	$2.9	$2.0	$2.2	$3.0	$9.4	$5.2	$8.5	$6.8	$6.8	$8.5	$10.3	$10.2	$8.6
Discovery Future	$24.9	$11.6	$33.9	$28.0	$13.9	$20.2	$22.3	$4.5	$5.0	$5.3	$28.3	$21.8	$82.4	$257.2
Strofio	$0.3	$1.6	$0.1	$0.6	$0.9	$1.3	$1.3	$1.0	$0.9	$1.0	$1.8	$1.2	$2.3	$2.4
InSight	$170.0	$91.9	$32.3	$74.3	$23.1	$13.6	$15.0	$11.4	<$0.0	-	-	-	-	-
Lucy	-	-	$54.5	$81.4	$165.5	$208.6	$139.9	$44.6	$18.9	$24.8	$25.9	$23.8	$34.8	$34.0
Planetary Management	-	$16.6	$12.1	$11.4	$12.9	$11.1	$21.6	$18.3	-	-	-	-	-	-
Discovery Research	$9.5	$15.8	$11.4	$6.7	$7.7	$6.9	$6.7	$7.8	$8.8	$9.2	$10.1	$12.1	$13.1	$13.4
Discovery Management	$7.6	-	-	-	-	-	-	-	$23.2	$41.2	$41.2	$38.5	$40.0	$43.0

PSD Budget 2015–2028

2018–2023: Enacted
2024–2028: From President's Budget Request (PBR)

Program (in Millions)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Mars Exploration	**$304.6**	**$512.9**	**$647.0**	**$678.0**	**$712.7**	**$565.7**	**$339.5**	**$265.0**	**$248.1**	**$268.6**	**$279.2**	**$311.6**	**$315.3**	**$367.2**
MOMA	$24.5	$12.5	$12.1	$12.9	$6.9	$7.3	$5.3	$3.4	$1.7	$0.2	-	-	-	-
Mars Future Missions	-	$3.5	$20.0	$1.7	$31.5	$65.5	$23.3	$6.9	$9.6	$49.9	$68.5	$108.4	$118.8	$177.4
Mars Technology	$7.0	$23.0	$22.9	$3.7	$20.6	$3.7	$10.1	$9.1	$6.6	$3.0	$3.0	$3.0	$3.0	$3.0
Mars 2020	$103.6	$321.8	$408.0	$505.8	$502.6	$353.0	$155.0	$111.1	$$91.1	$85.0	$80.5	$82.0	$82.5	$83.0
TGO - ExoMars	$1.5	$1.3	$2.2	$1.9	$2.1	$1.9	$2.1	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0	$2.0
MSL	$63.4	$50.3	$56.2	$51.4	$51.1	$47.4	$48.9	$45.2	$45.0	$40.5	$35.0	$30.0	$25.0	$20.0
MRO	$27.9	$27.7	$28.0	$26.3	$26.0	$26.9	$28.3	$24.4	$25.7	$25.6	$25.4	$25.4	$25.4	$25.0
Mars Odyssey	$12.0	$9.7	$10.8	$11.3	$11.5	$11.7	$11.4	$10.6	$11.1	$11.0	$6.2	-	-	-
Mars Express	$2.5	$2.9	$3.0	$2.7	$3.1	$1.1	$0.3	<$0.0	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3
Mars Mission Operations	$1.5	$1.5	$1.9	$1.7	$1.9	$5.9	$6.8	$6.7	$5.5	$5.5	$5.5	$5.6	$5.4	$5.4
MAVEN	$13.8	$21.3	$20.5	$22.2	$17.9	$20.5	$21.0	$22.0	$23.0	$23.0	$24.0	$24.0	$24.0	$22.0
Mars Program Management	$23.4	$13.3	$24.2	$8.5	$11.8	$10.8	$12.7	$10.8	$11.8	$6.9	$13.2	$15.3	$13.3	$13.5
Mars Research & Analysis	$9.9	$9.9	$10.0	$10.0	$9.9	$9.9	$14.4	$12.7	$14.7	$15.7	$15.7	$15.7	$15.7	$15.7
Mars Rover 2023	$13.7	$14.2	$12.5	$12.5	$3.5	-	-	-	-	-	-	-	-	-
Aeroscience Ground Test	-	-	$14.6	$5.5	$12.5	-	-	-	-	-	-	-	-	-

PSD Budget 2015–2028

2018–2023: Enacted
2024–2028: From President's Budget Request (PBR)

Program (in Millions)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Planetary Defense	**$39.9**	**$49.9**	**$60.0**	**$76.0**	**$150.0**	**$150.0**	**$158.1**	**$166.0**	**$135.5**	**$250.7**	**$337.7**	**$400.5**	**$299.6**	**$79.0**
NEO Surveyor	-	-	-	-	-	-	$31.3	$110.0	$90.0	$209.7	$297.7	$358.5	$257.6	$39.0
DART	-	-	-	$41.0	$98.0	$72.4	$75.5	$13.8	$3.5	-	-	-	-	-
Near Earth Object Observations	$39.9	$49.9	$60.0	$35.0	$52.0	$77.6	$51.3	$42.2	$42.0	$41.0	$41.0	$42.0	$42.0	$40.0
Radioisotope Power	**$123.8**	**$134.8**	**$121.1**	**$139.8**	**$123.3**	**$133.5**	**$146.3**	**$148.6**	**$154.9**	**$175.5**	**$201.1**	**$174.6**	**$166.8**	**$160.9**
Radioisotope Power System	$25.2	$29.0	$32.4	$33.3	$38.8	$48.0	$58.2	$48.3	$63.7	$67.1	$78.4	$56.2	$39.6	$32.3
Advanced Technology	$6.2	$32.3	$13.2	$31.4	$1.5	-	-	-	-	-	-	-	-	-
Plutonium	$17.0	$17.7	$20.0	$16.0	-	-	-	-	-	-	-	-	-	-
DOE Operation & Analysis	$57.4	$55.8	$55.5	$59.1	$83.0	$85.5	$88.1	$90.3	$91.2	$108.4	$122.7	$118.5	$127.2	$128.6
Planetary Science Research / Other	**$247.4**	**$260.2**	**$267.3**	**$279.5**	**$276.6**	**$286.0**	**$304.1**	**$309.0**	**$290.6**	**$307.4**	**$333.3**	**$352.0**	**$360.2**	**$386.4**
Astromaterial Curation	$6.4	$8.5	$9.1	$9.5	$12.5	$11.2	$12.9	$16.0	$12.1	$12.4	$12.4	$14.0	$14.4	$14.2
Rosetta	$14.3	$12.4	$7.8	$5.4	$1.0	-	-	-	-	-	-	-	-	-
Robotics Alliance	$4.0	$4.3	$4.1	$4.1	$4.1	$4.0	$4.0	$4.0	$5.0	$4.0	$5.0	$5.0	$5.0	$5.1
Planetary Science R&A	$161.7	$162.4	$178.1	$197.9	$195.7	$209.8	$223.2	$221.3	$205.1	$224.6	$249.3	$261.5	$267.4	$290.3
Advanced Multi-Mission Operation System	$35.4	$37.0	$37.2	$39.9	$40.2	$39.2	$39.9	$40.5	$40.5	$38.0	$38.0	$38.0	$37.7	$38.2
Planetary Data System	$13.7	$15.0	$14.5	$16.8	$17.0	$19.2	$24.1	$27.3	$27.8	$28.4	$28.6	$33.5	$35.7	$38.6
Science Data &. Computing	$2.0	$2.3	$2.4	$2.5	$2.7	$2.6	-	-	-	-	-	-	-	-
PS Directed R&T	-	-	-	$3.4	$3.4	-	-	-	-	-	-	-	-	-