Planets and Asteroids and Moons...OH MY!

EXPLORE SCIENCE

Eric E. Ianson
Deputy Director, Planetary Science Division
Director, Mars Exploration Program
NASA Headquarters

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NASA’s Key Science Themes

- Protect & Improve Life on Earth & In Space
- Search for Life Elsewhere
- Discover Secrets of the Universe
• Sample Collection from asteroid Bennu
• Touch-and-Go (‘TAG’) at Nightingale Crater: Oct 20, 2020

The Canadian Space Agency provided the OSIRIS-REx Laser Altimeter, a scanning & lidar instrument that provided high resolution topographical information.

Samples landed at Utah Test and Training Range, September 24, 2023
OSIRIS-REX: To Bennu – and Back!

Sample catalog is out: https://curator.jsc.nasa.gov/osirisrex/index.cfm

Overview manuscript (in review) available on Arxiv: https://arxiv.org/abs/2404.12536
OSIRIS-REx: Sample Surprises

Sample catalog: https://curator.jsc.nasa.gov/osirisrex/index.cfm


Top: Bennu sample contained in eight trays
Left: Bennu particle (about 1 mm long) with crust of bright phosphate
Right: Magnetite spheres with radially projecting needles next to dodecahedral crystals
September 26, 2022
7.10–7.15 pm EST
DRACO images streamed to Earth from 7 million miles away (10 x speed)
Impact witnessed by ATLAS telescope

Before: 11 hr 55 min

After: 11 hr 22 min

Change: 33 mins!

LICIACube image showing plumes of ejecta streaming from Dimorphos after impact
Psyche Mission

Launched: October 13, 2023
Psyche Orbit Insertion: August 2029
Orbital mission: ~26 months

What is this asteroid
Asteroid Psyche appears to be the exposed nickel-iron core of an early planet, one of the building blocks of our solar system.
Lucy launch, Cape Canaveral, Oct 16, 2021

Lucy

- Launched: October 2021
- Observation Targets:
  - 1 Main Belt Asteroid
  - 6 Trojan Asteroids
- Mission Duration: 12 years

Encounter with Main Belt Asteroid Dinkinesh

Nov 1, 2023
Let’s Talk Mars!
MSL Curiosity Rover

- Curiosity landed in Gale Crater in August 2012 and is exploring Mount Sharp (Aeolis Mons), a 3-mile-high mountain within the crater. The rover has completed 31 km of traverse, gained 760 meters in elevation, and analyzed 45 samples as of late 2023.
- The mission found that the crater floor and lower Mount Sharp formed in ancient rivers and lakes that contained carbon-based molecules that are necessary for life as we know it.
- Curiosity is currently exploring layers on Mount Sharp that formed during a time of dramatic change from wetter to drier conditions, with a goal of understanding the persistence of habitability.
Mars Perseverance Rover

• Landed on Mars February 18, 2021
• Exploring Jezero Crater
• Taking Samples from Mars to return to Earth

Perseverance by the numbers (as of 9 July 2024):
• Rover Odometry: 28,502.3 meters
• On Rover Samples: 14 rock cores, 1 regolith sample, 2 witness tubes
• Three Forks Cache: 7 rock cores, 1 regolith sample, 1 atmospheric sample, 1 witness tube
• Remaining Tubes: 12 sample tubes, 2 witness tubes
Green highlights tubes cached at Three Forks.

Sample Collection Map: Tubes 1-21

Rock abrasion patches/regolith surface are outlined in red.
Mars Ingenuity Helicopter

- 72 flights successfully completed
- Flown over 17 kilometers
- Completed 128.8 flying minutes
- Maximum altitude achieved: 24 meters

Mission ended on 25 Jan 2024
Where is Perseverance?

Location as of 9 July 2024
Orbiting spacecraft at Mars:

- Make global science measurements
- Provide information about the terrain and weather
- Relay information between Earth and Mars surface assets
Mars Sample Return Animation Video

https://mars.nasa.gov/msr/multimedia/videos/?v=523
Current and Future Amazing Missions!
Europa Clipper

- Mission to Jupiter’s moon, Europa, launching Oct 2024
- Overarching goal: determine if Europa has conditions suitable to support life
  - Contains all the ingredients: water, chemistry, energy
Dragonfly

• Targeted Launch: June 2027
• Titan Arrival: 2034
• Rotorcraft lander w/science instrument suite
Return to Venus

DAVINCI
Deep Atmosphere Venus Investigation of Noble Gases, Chemistry, and Imaging

VERITAS
Venus Emissivity, Radio Science, InSAR, Topography, & Spectroscopy

EnVision
ESA Medium-Class Mission
NASA contribution includes VenSAR (Synthetic Aperture Radar)
Uranus Orbiter and Probe recommended by the NASEM Decadal Survey as the next Planetary “Flagship” mission
NASA and Australia
NASA – Australia Cooperation

NASA has close to 30 active agreements with a variety of Australian organizations with a shared interest in Earth science, space science, human space exploration, and education.

Partnering with Australian National University on Low-Cost Optical Terminal

Australia signs Artemis Accords in Oct 2020 (photo Credit ASA)

NASA Astrophysics Sounding Rockets Launched in Northern Territory

Astrobiology field work in the Pilbara (photo credit: Eben Rose)

NASA and ASA are collaborating on a lunar rover for launch in 2026 (photo Credit ASA)
2023 Field Visit to the Pilbara

The Pilbara stromatolite formations represent the earliest evidence of life on Earth (~2.72 billion years old) and contributes to astrobiology studies, as a Mars analog site.
Established in Australia in the 1960s, CDSCC – as part of NASA’s Deep Space Network – supports interplanetary spacecraft missions, plus a few that orbit Earth.

Official website: www.cdscc.nasa.gov

@Canberra_DSN on Twitter

/Canberra/DSN on Facebook

Follow mission communications from the Deep Space Network ground stations in real-time: https://eyes.nasa.gov/dsn/dsn
NASA, ESA, JAXA, ASA, and CSIRO
Collaborating on Mars Technology