

An artistic illustration of a Mars exploration scene. In the foreground, a Mars rover with solar panels is on the reddish-brown surface. In the background, a Mars lander is shown with its ascent stage being launched into the sky, leaving a long, curved smoke trail. A Mars orbiter is visible in the upper right corner, and a small satellite is in the upper left. The sky is a hazy orange-brown color.

EXPLORE

Webinar | Mars Exploration: Blueprint for the Red Planet

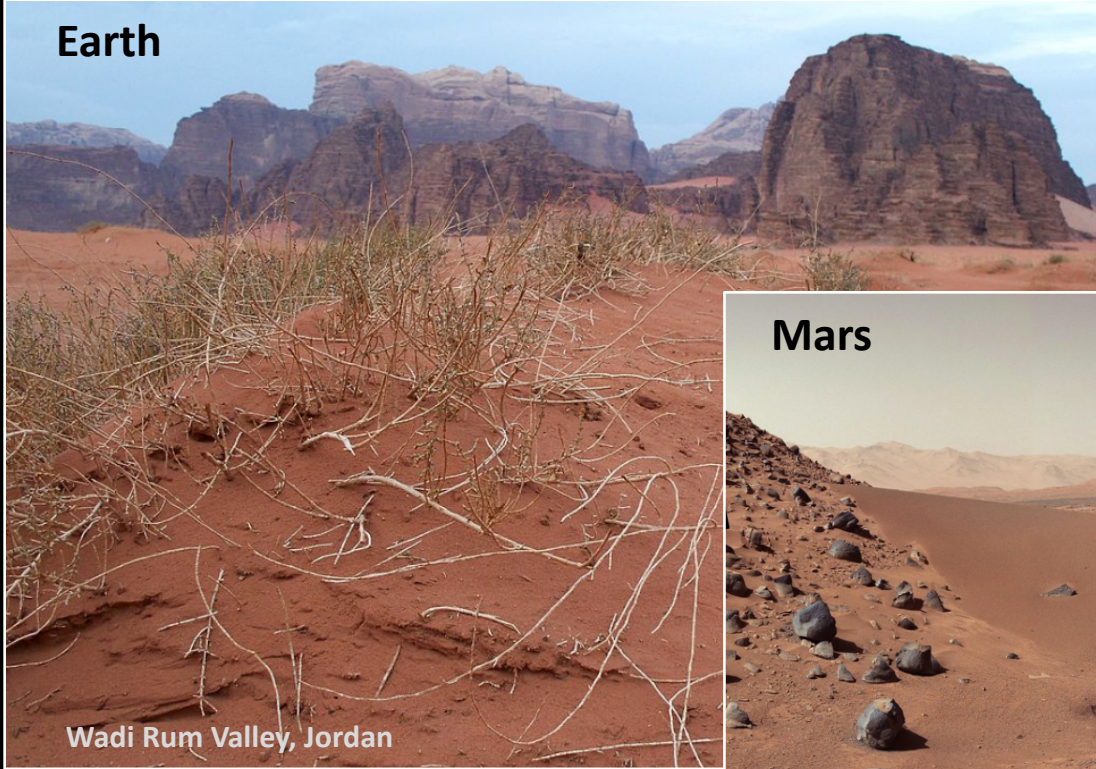
Jim Watzin

Director – Mars Exploration Program

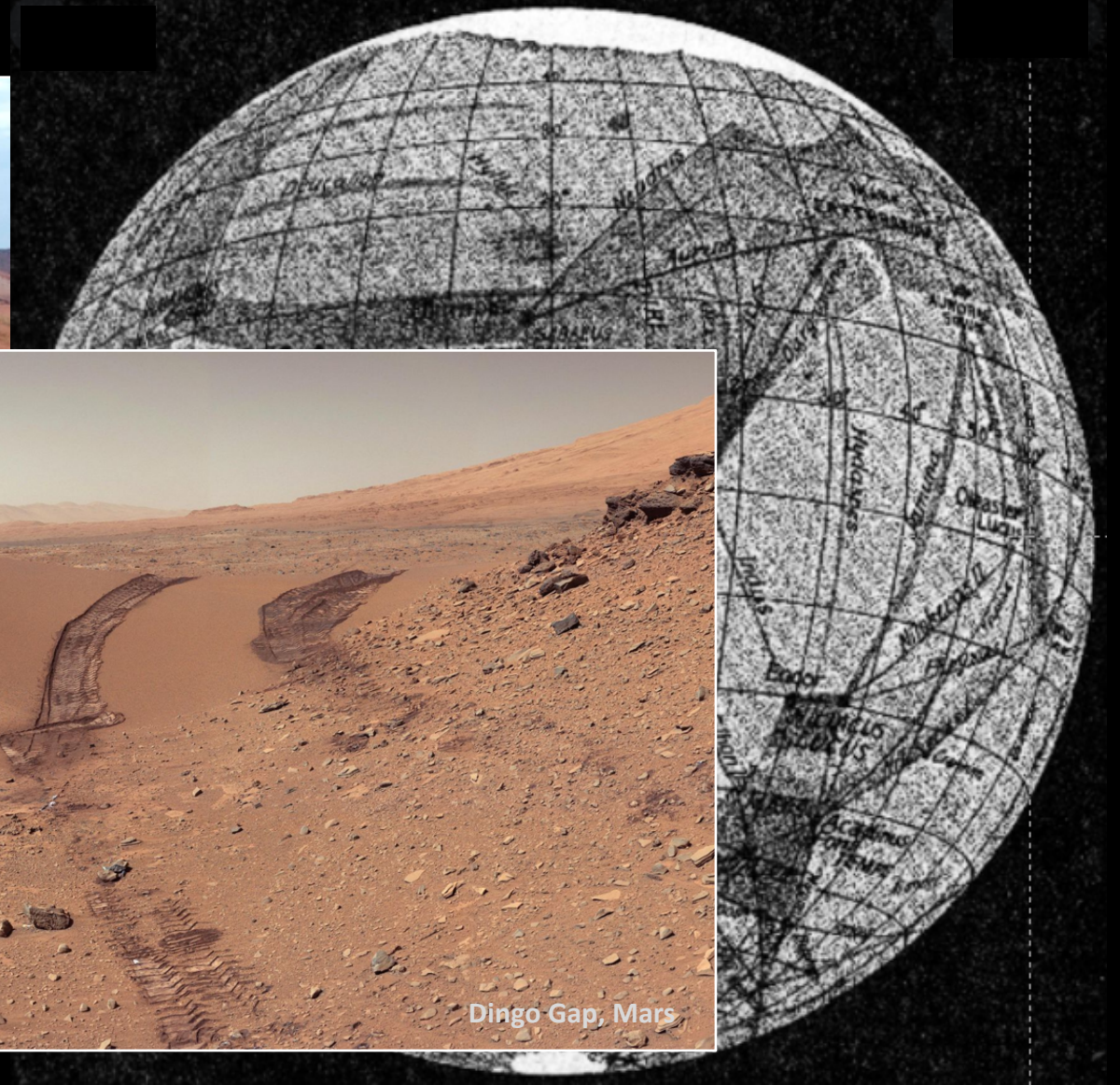
June 24, 2020

Similarities, Yesterday and Today

Earth



Mars



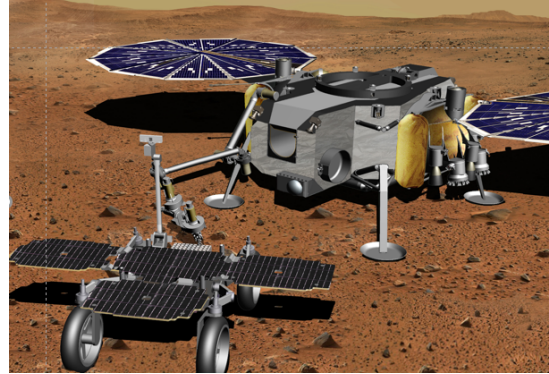
MSR Campaign Mission Elements



M2020 Rover

(July, 2020)

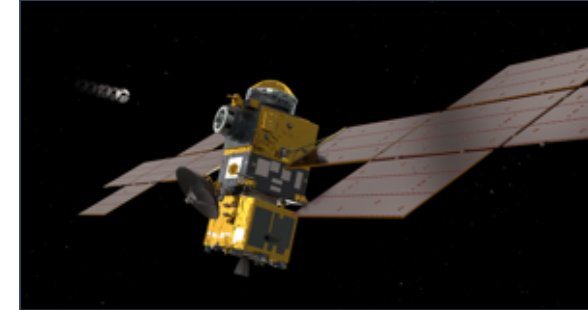
- **Land** in Jezero Crater
- **Explore** and **characterize**
- **Collect** samples for future return. **Retain** some samples for delivery to SRL. **Deposit** some samples on Martian surface for retrieval by the SFR
- **Deliver** retained samples to SRL for transfer to OS



Sample Retrieval Lander

(July, 2026)

- **Land** in the proximity of Jezero Crater
- **Deploy** ESA-supplied **SFR** to **retrieve samples** cached by Mars 2020 at one or more depots, and **receive samples delivered** by M2020
- **Transfer** samples to **OS** onboard **MAV**
- **Launch MAV** to place **OS** in **stable Low-Mars Orbit**



Earth Return Orbiter

(October, 2026)

- **Deliver** NASA-supplied **CCRS** payload to Mars orbit
 - **Satisfy Planetary Protection requirements** for returned samples
- **Provide UHF relay** support to SRL EDL and surface mission (SFR, M2020, and MAV)
- **Capture OS** in low-Mars Orbit
- **Contain** the captured OS
- **Return to Earth** and **deliver the EEV** on trajectory to UTTR landing

Robust Sample Retrieval Strategy
SFR Fetch
M2020 Delivery



Ready for MSR

- ✓ # Mars orbits flown by U.S. **193,560 orbits**
 - Mariner 9: ~700 orbits (deactivated in parking orbit), Viking 1 orbiter: 1485 orbits (deactivated in parking orbit), Viking 2 orbiter: ~700 orbits (deactivated in parking orbit), MGS: 35,885 orbits (lost), Odyssey: ~80,500 orbits (and counting), MRO: 63,418 orbits (and counting), MAVEN: 10,872 orbits
- ✓ # Successful U.S. Mars landings **8 landings**
 - Viking 1 lander, Viking 2 lander, Pathfinder/Sojourner, Spirit, Opportunity, Phoenix, Curiosity, InSight
- ✓ # Km driven by U.S. Mars rovers **75 km**
 - Sojourner: 0.104 km, Spirit: 7.73 km, Opportunity: 45.16 km, Curiosity: 22.093 km (and counting)
- ✓ # Years exploring Mars **49 yrs**

(as of 6 Feb 2020)

NASA



ODYSSEY



MRO



MSL



MAVEN



INSIGHT

INTERNATIONAL



MARS EXPRESS



EXOMARS/TGO



MOM

2020



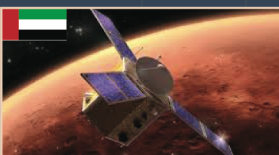
MARS 2020



EXOMARS



HX-1



HOPE

2025



MSR



MSR

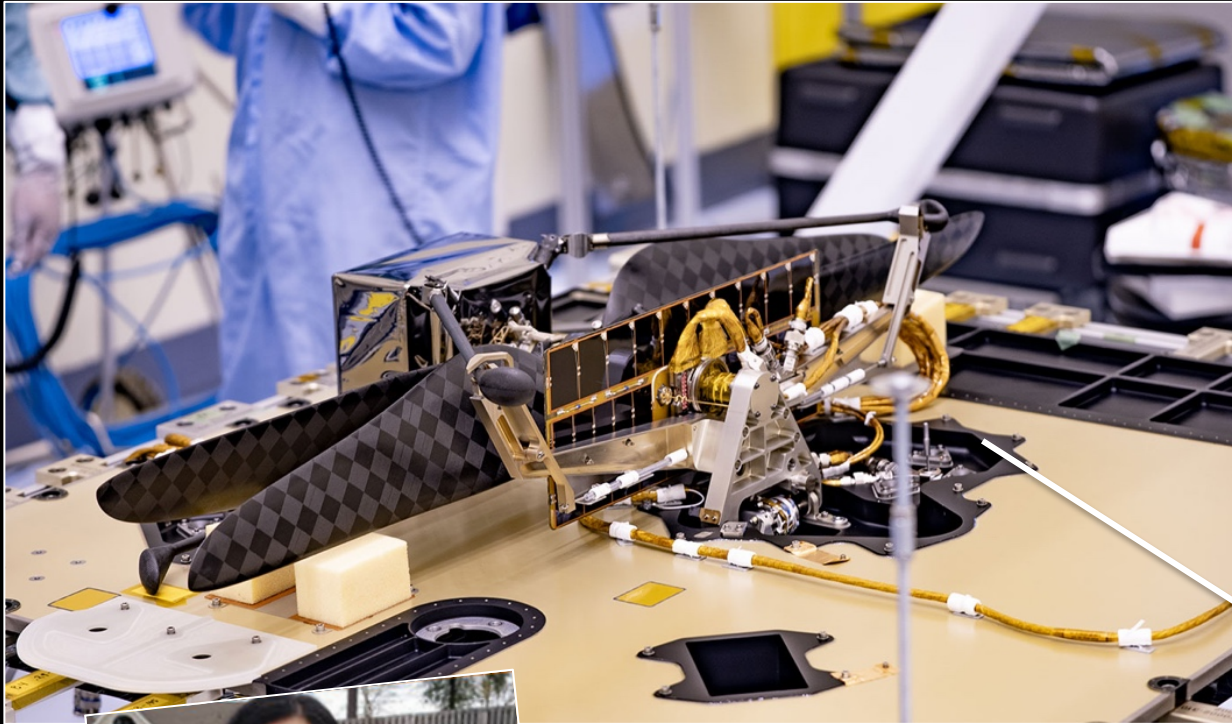


MMX

2030

Growing Interest in Mars Exploration

Mars Helicopter Tech Demo



"Ingenuity"

