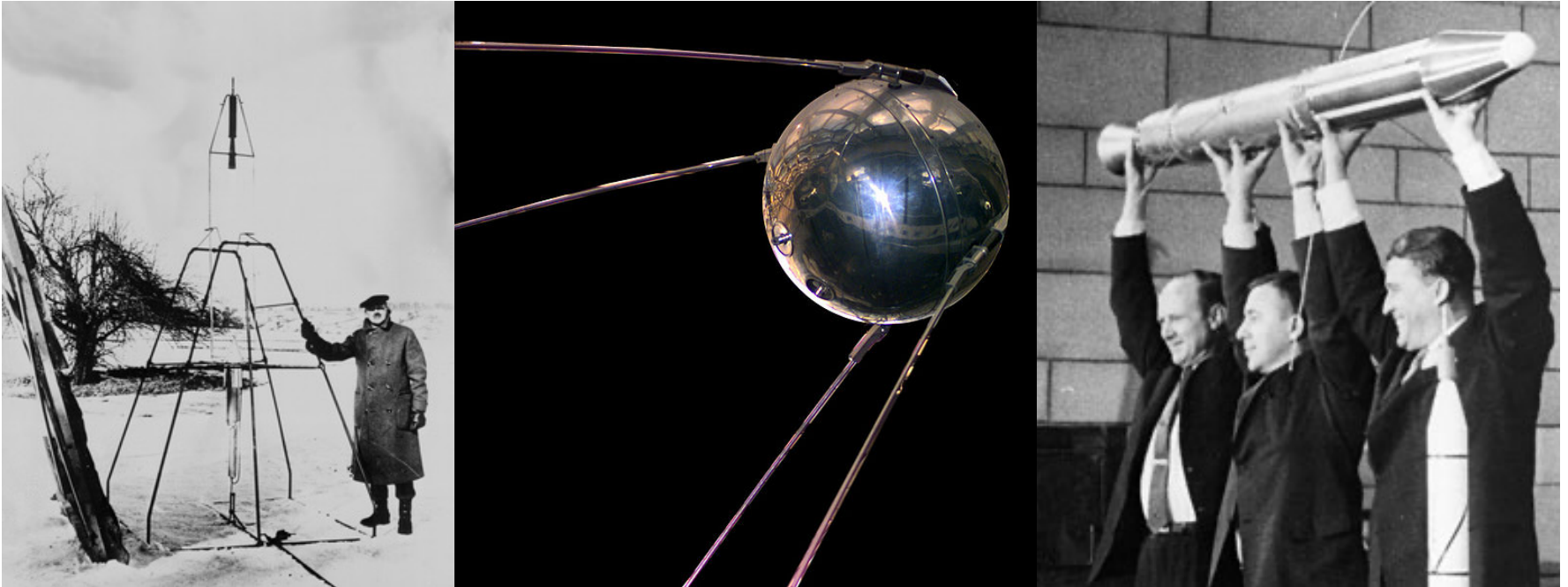


NASA's Space Missions to Mars

David H. Lehman
NASA / Jet Propulsion Laboratory,
Project Manager (Retired) and
Volunteer Solar System Ambassador



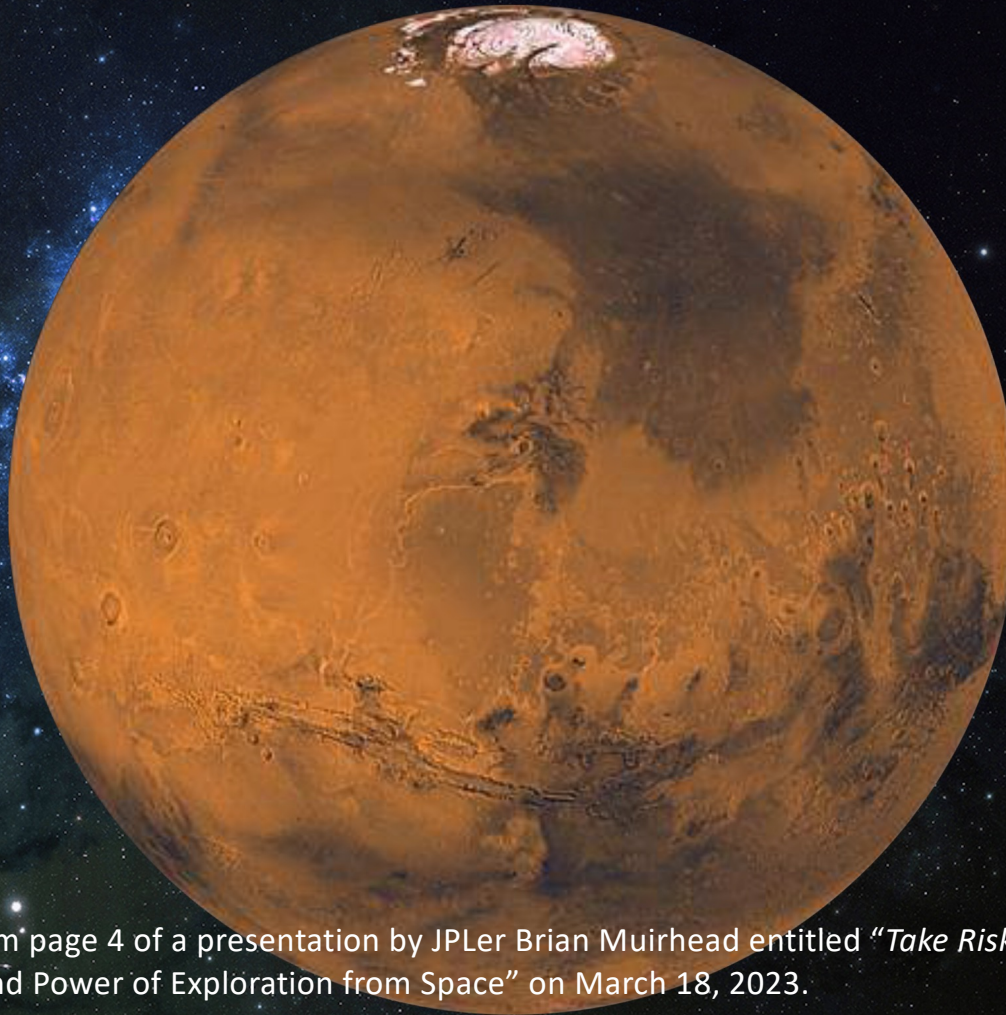
Beginnings of the Space Age *



* Reference: From page 2 of a presentation by JPLer Brian Muirhead entitled *"Take Risk Don't Fail - Challenges and Power of Exploration from Space"* on March 18, 2023.



Mars*

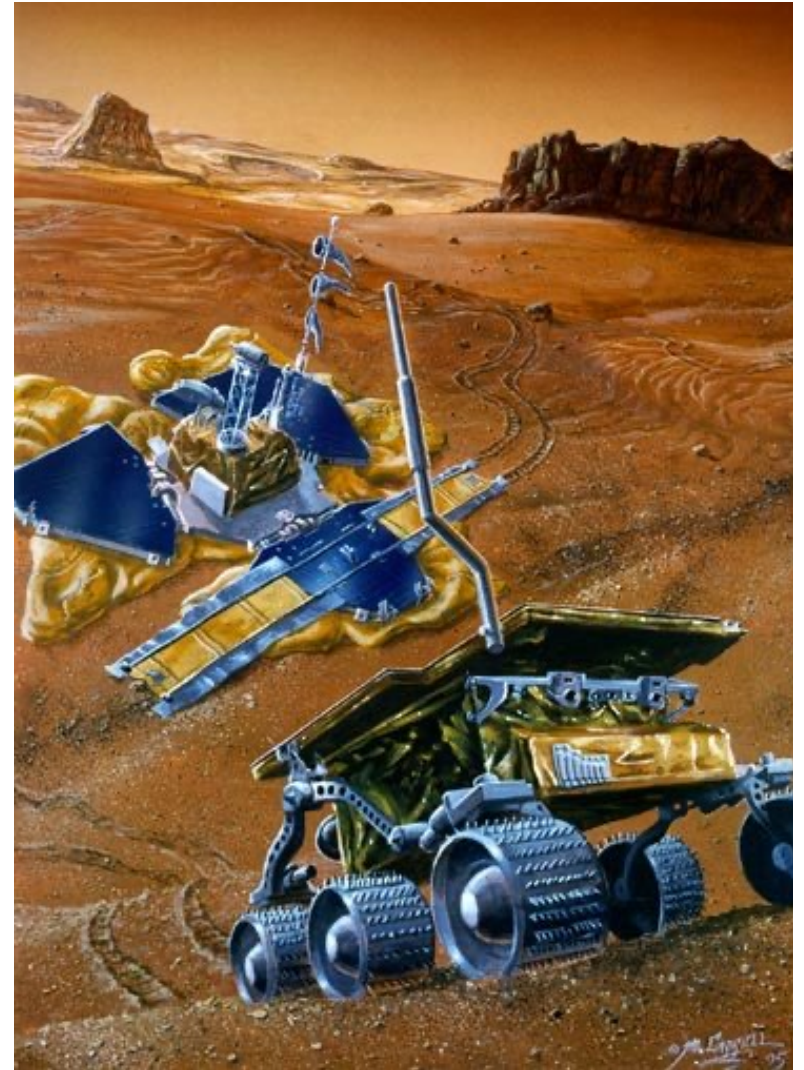


- Reference: From page 4 of a presentation by JPLer Brian Muirhead entitled "*Take Risk Don't Fail* - Challenges and Power of Exploration from Space" on March 18, 2023.

Background - 1

- I worked for 40-years at NASA's Jet Propulsion Laboratory (JPL) of the California Institute of Technology (Caltech)
- Projects included Mars Pathfinder Avionics Technical Manager
 - First Planetary Rover (July 4, 1997)*

Reference* <https://www.jpl.nasa.gov/timeline/>







Donna Shirley

Manager of the Jet Propulsion Laboratory's Mars Exploration Program
with DANELLE MORTON

Managing Martians

*The extraordinary story of
a woman's lifelong quest to
"get to Mars"—and of the
team behind the space
robot that has captured the
imagination of the world*

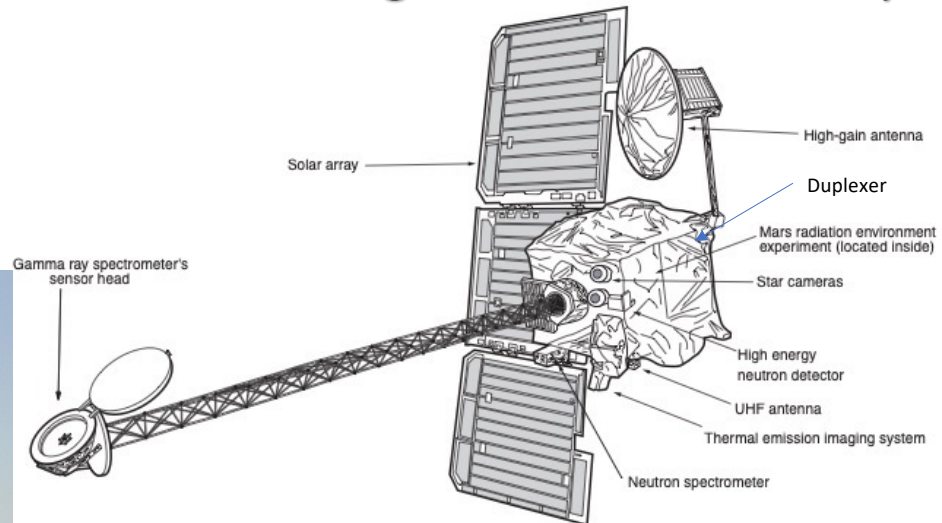
"An engaging story...
Anyone who wants an insid-
er's look at America's space
program or a glimpse of its
strengths and weaknesses will
enjoy *Managing Martians*."
—Discover

Background – 2

- 2001 Mars Odyssey Project Manager from 2013 to 2021
 - First Detection of Frozen Water Beneath the Surface of Mars (May 28, 2002)*



Space Missions in a Nutshell Using the Schematic of Odyssey



2001 Mars Odyssey spacecraft

Reference* <https://www.jpl.nasa.gov/timeline/>

What is going on at Mars? NASA is operating 3 orbiters and 2 rovers plus 1 helicopter. ESA is operating 2 orbiters

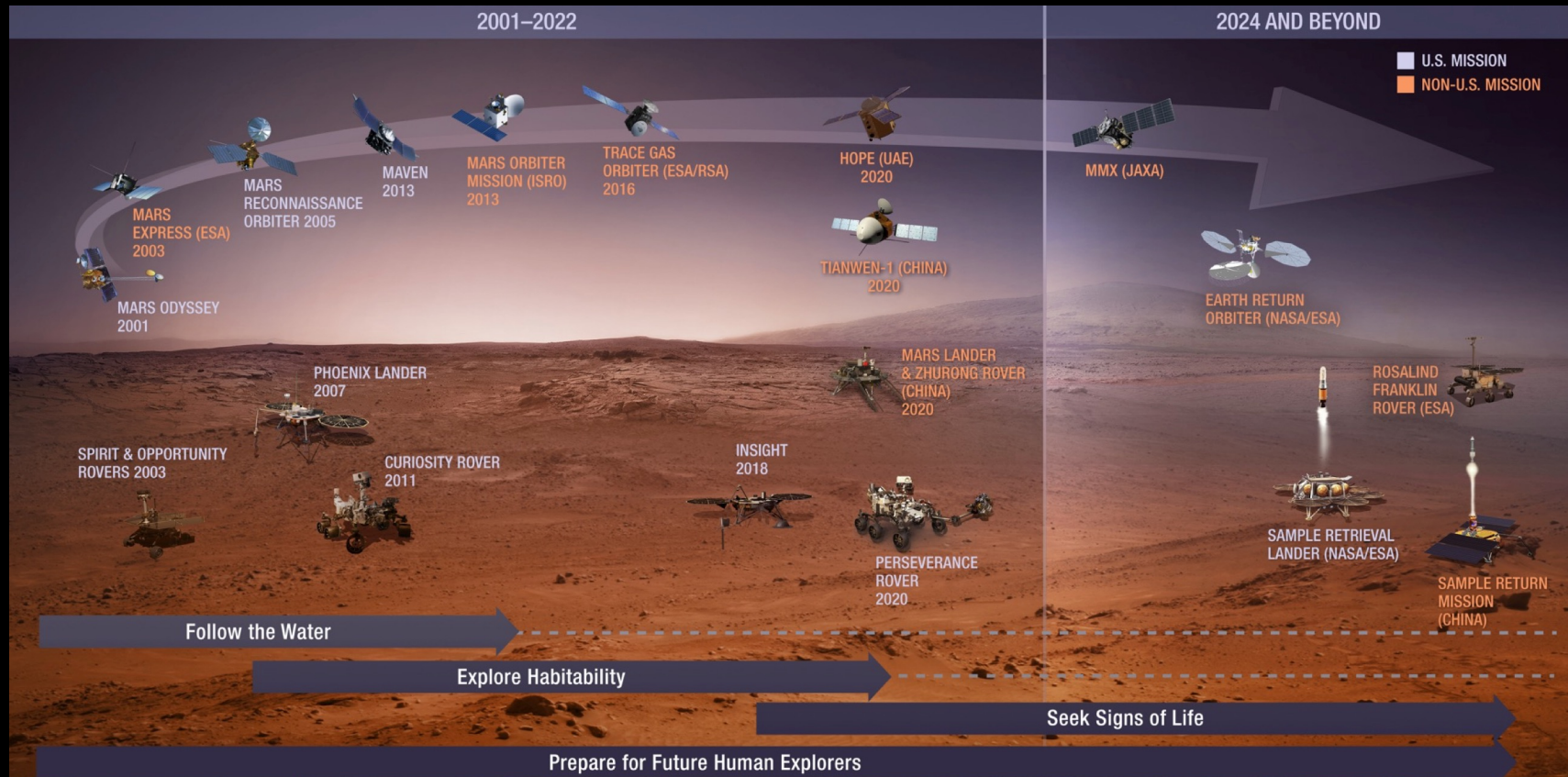
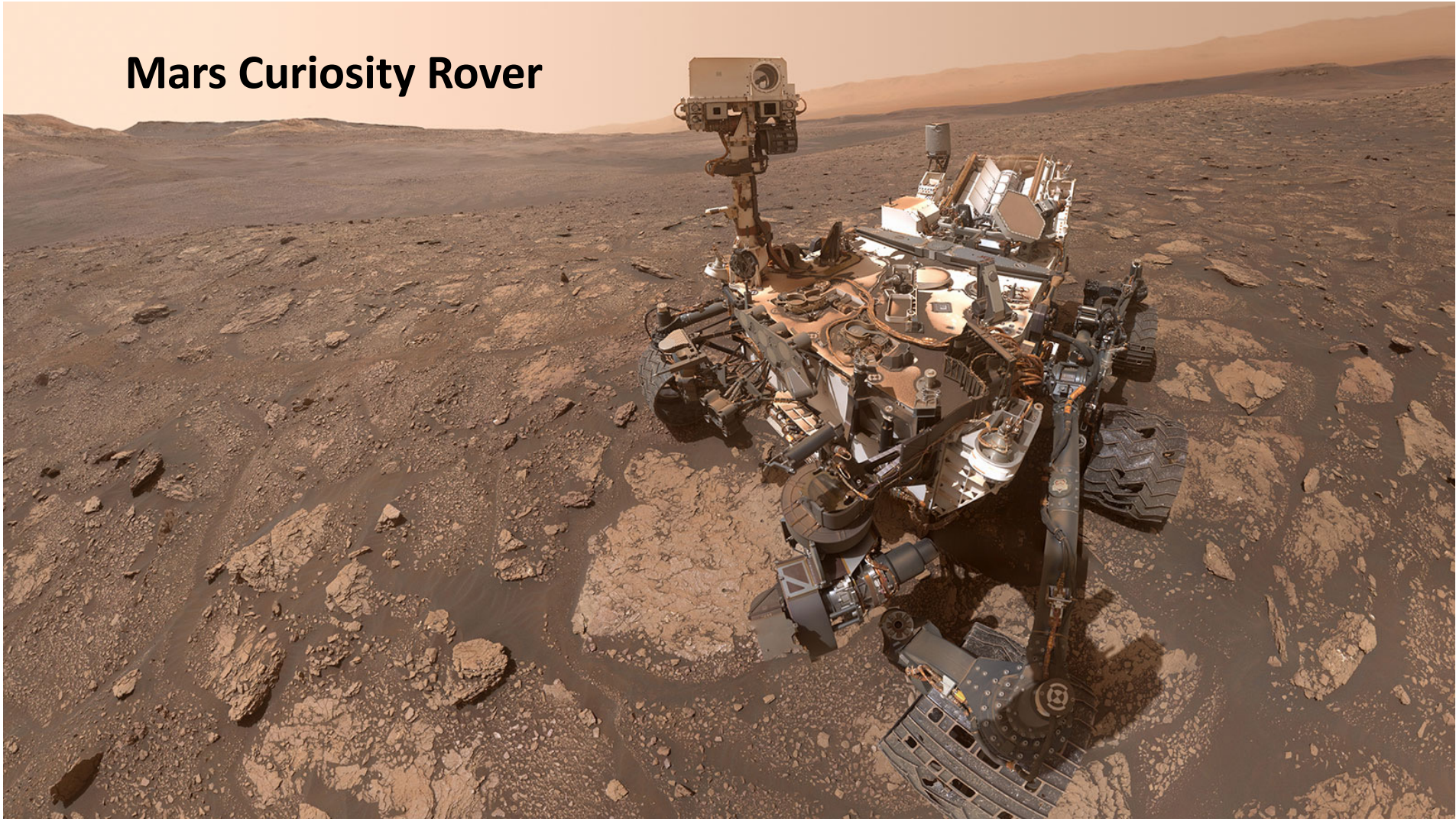


Chart is from A. Yingst at the Mars Exploration Program Analysis Group (MEPAG) meeting of Feb. 27, 2023

Mars Curiosity Rover



Wheel of Mars Curiosity rover after 10 years of operations





Three Generations of Mars Rover Innovation

B. Spirit Rover

C. Curiosity Rover

A. Sojourner Rover

* Reference: From page 11 of a presentation by JPLer Brian Muirhead entitled "*Take Risk Don't Fail - Challenges and Power of Exploration from Space*" on March 18, 2023.

NASA's Perseverance Mars rover
landed on Mars on February 18, 2021.
It took this selfie over a rock
nicknamed "Rochette," on
September 10, 2021

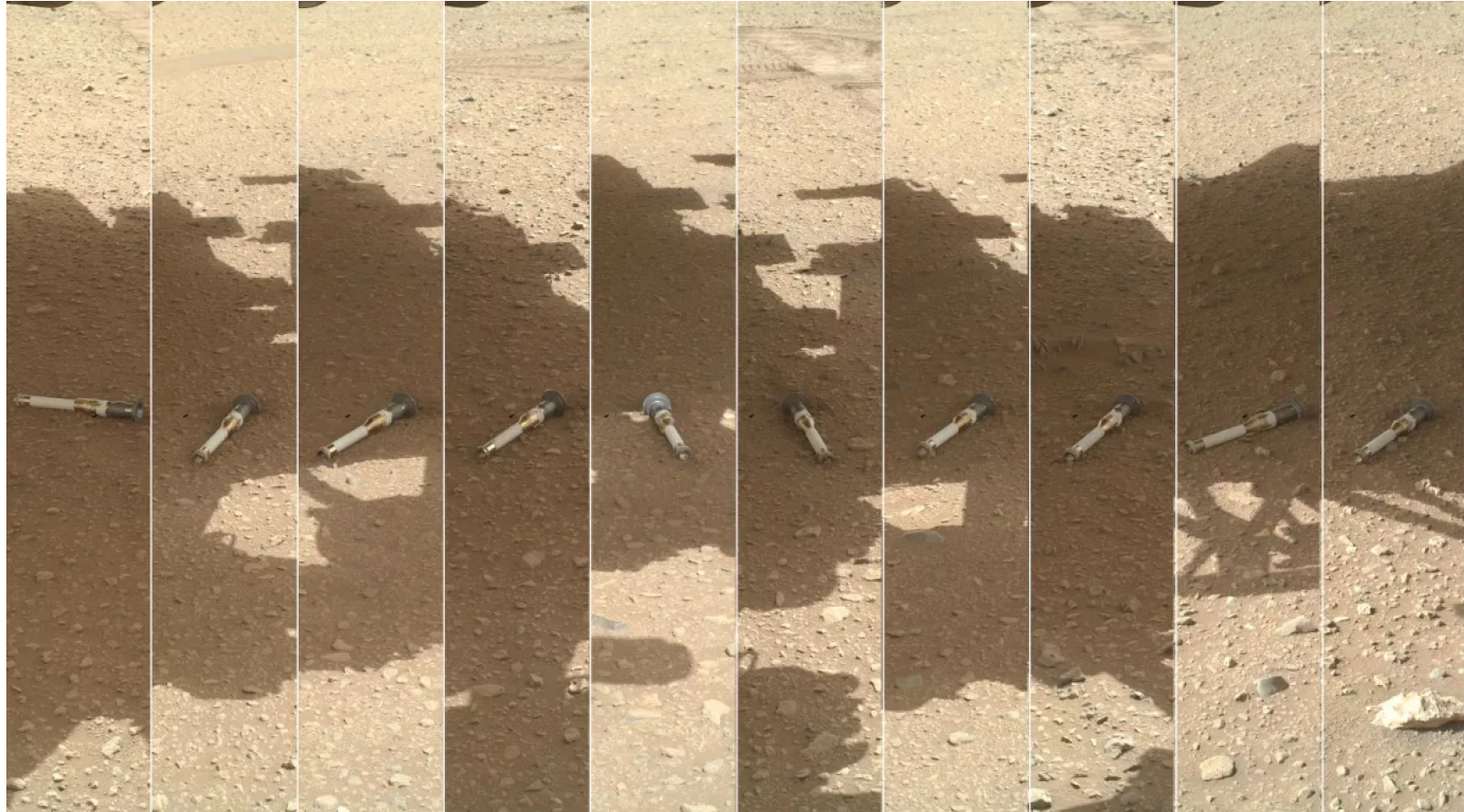


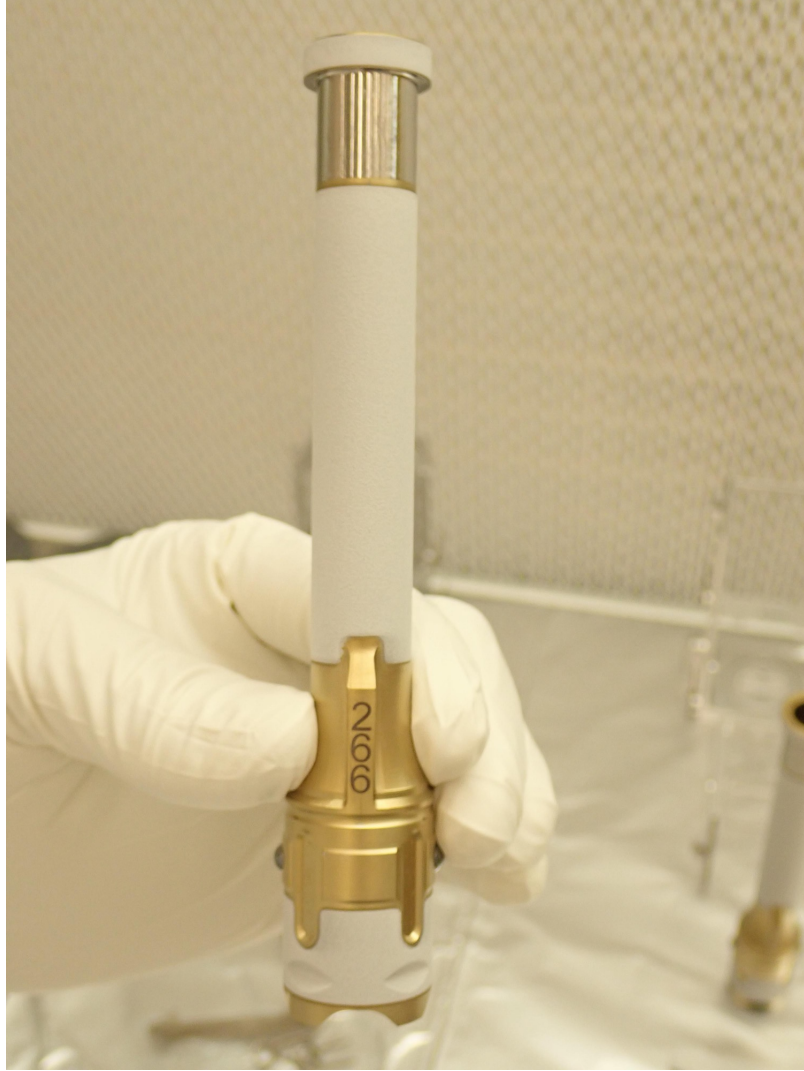






Caching Samples at Three Forks (10 samples)





What's Next for Mars?





ARTEMIS

Twin sister of Apollo and goddess of the Moon in Greek mythology. With Artemis missions, NASA will:

- Collaborate with international and commercial partners to establish the first long-term presence on the Moon,
- Land the first woman and first person of color on the Moon, and
- Use what we learn on and around the Moon to take the next giant leap: sending the first astronauts to Mars.

This slide is adapted from slides by NASA ARTEMIS Chief Nujoud Merancy, dated Oct. 21, 2021.

Should future Mars missions have all-female crews?



Artist's depiction of a female astronaut on the surface of Mars. (Image credit: janiecbros/Getty Images)

Thank You.



Back Ups


- Mars Helicopter Project Manager MiMi Aung
- Plan of action to have a successful life
- Words to song “Want to Live on Mars”

zoom.us Meeting View Edit Window Help 01:15:33 Mon Apr 24 12:56 PM

Zoom Webinar

Recording


Live Transcription (Closed Captioning) has been enabled Who can see this transcript? Recording On X



The Sky's Not the Limit: My Journey into Space Exploration and STEM

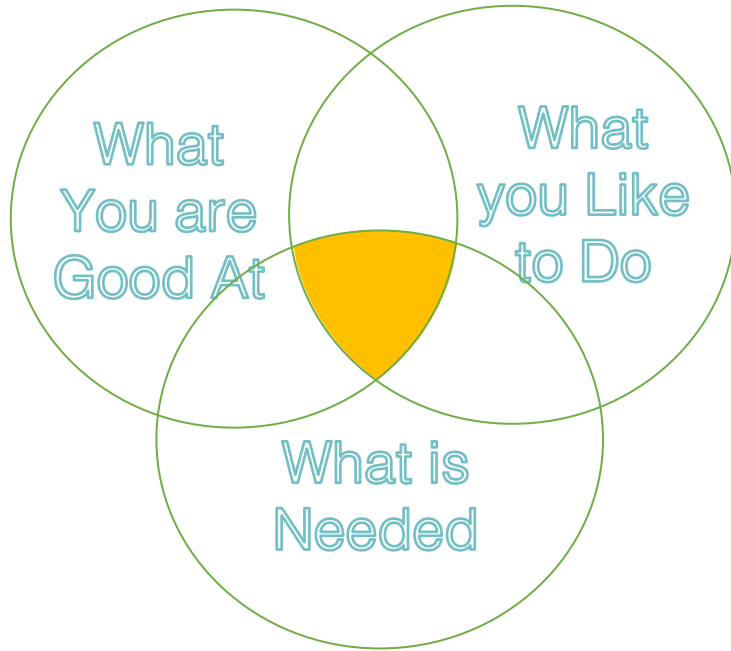
Kim and Judy Davis Dean's Lecture
in the Sciences

The program will begin momentarily.



Harvard
Radcliffe
Institute

macOS dock with various application icons including Safari, Chrome, Firefox, and Zoom.



Hard
Work

Critical
Thinking



Dream → Reality

Want to Live on Mars

by Kasia the Martian

Oh yeah, I'll tell you somethin'
Red dot among the stars
When I see that shinin'
I want to live on Mars
I want to live on Mars
I want to live on Mars

Oh please, say to me
You'll let me roam the stars
And please, say to me
You'll let me live on Mars
Now, let me live on Mars
And climb Olympus Mons

But if we go there
You'll need thermal attire
At negative 200...really –
You might die...
You could die...
You will die!

Yeah, Mars has those microbes (theoretically)

Red dot among the stars
Dormant in its Ghost Dunes
I want to live on Mars
I want to live on Mars
I want to live on Mars

You'll need to wear that
Helmet constantly
Coz' without O2 present, you...
Can't breathe
You can't breathe
You can't breathe!

Yeah, Mars has that somethin'
Red dot among the stars
When I see it shinin'
I want to live on Mars
I want to live on Mars
I want to live on Mars
And climb Olympus Mons