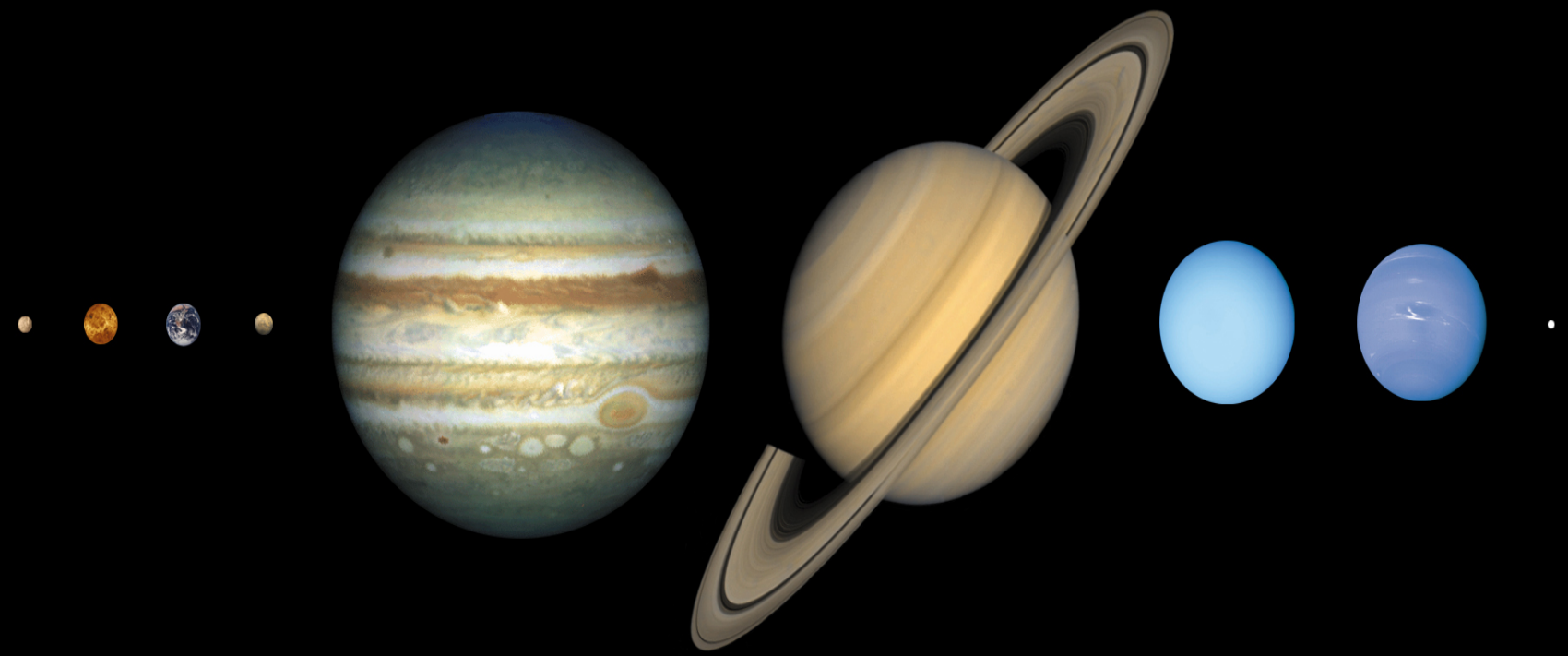
Solar System Series: Mars

Peterborough Astronomical Association
Novice Astronomy Class
January 2, 2026
Brett Hardy

Size Scale



Lunar & Planetary Institute

Mars By the Numbers

- 228 million km away from Sun
  - 13 light minutes
- 206,600,000 km – 249,200,000 km
- ~ 56 million km from Earth
- 7th largest planet – half the size of Earth – 6,790 km in diameter
- Axial tilt: 25°
- Day: 24.6 hours
- Year: 687 Earth days
- 1/3 Earth's gravity
- Temperature: -153° C – 20° C

Atmosphere

- Thin atmosphere: CO_2 (95%), N_2 (3%) and argon (2%)
- 1% that of Earth
- Carbon dioxide snow clouds
- Hazy red sky due to suspended dust
- Global dust storms can last months
- Dust devils
- Much warmer with a thicker atmosphere, wetter with liquid water on the surface billions of years ago

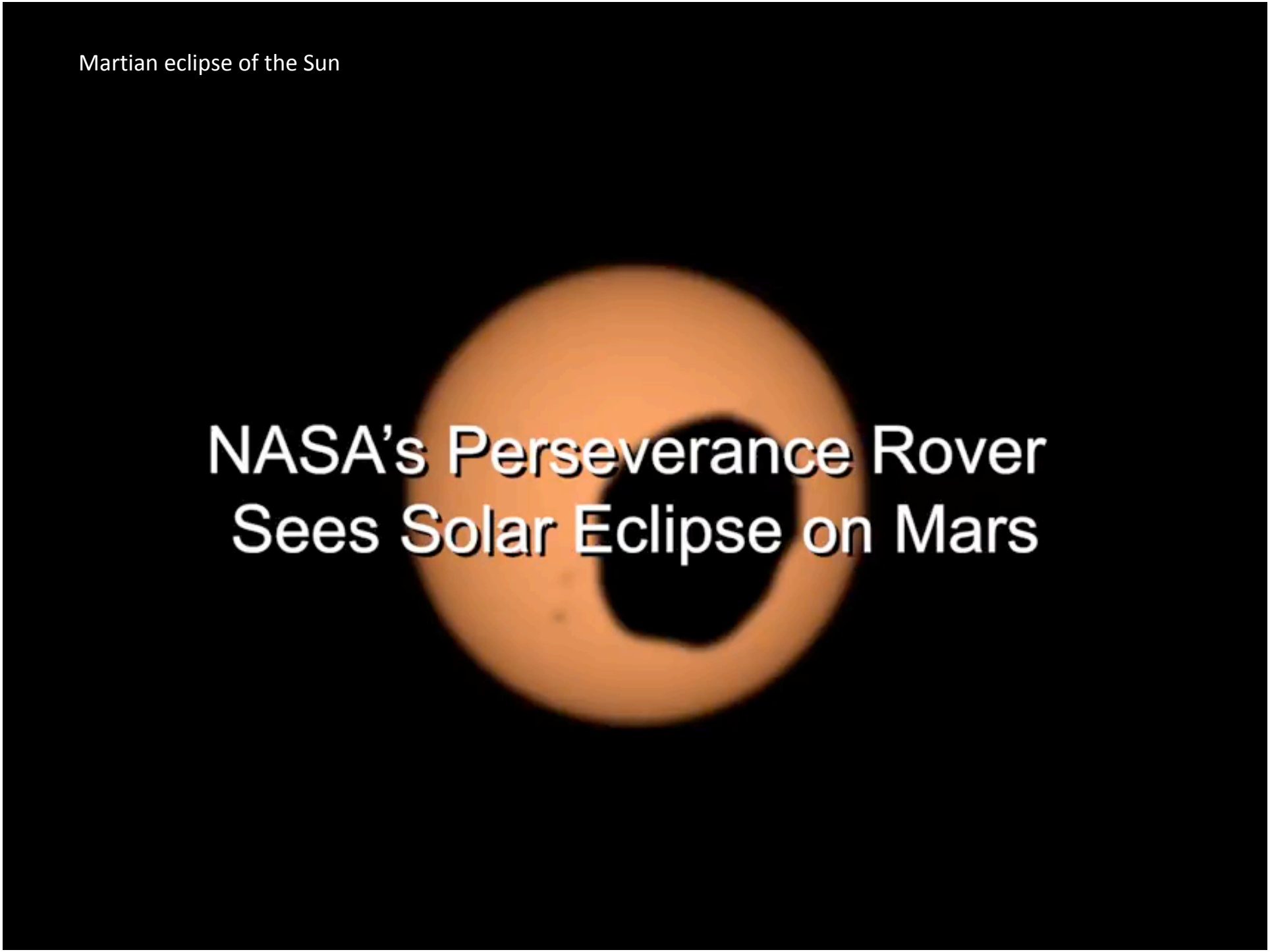
Brian Colville

Moons

- Moons: Phobos, Deimos
- Both potato-shaped
- Phobos is the innermost and largest - 27 km across
- Deimos half its size
- Phobos' orbit is degrading and will crash into Mars 50 million years

Jason Lichter

Martian eclipse of the Sun



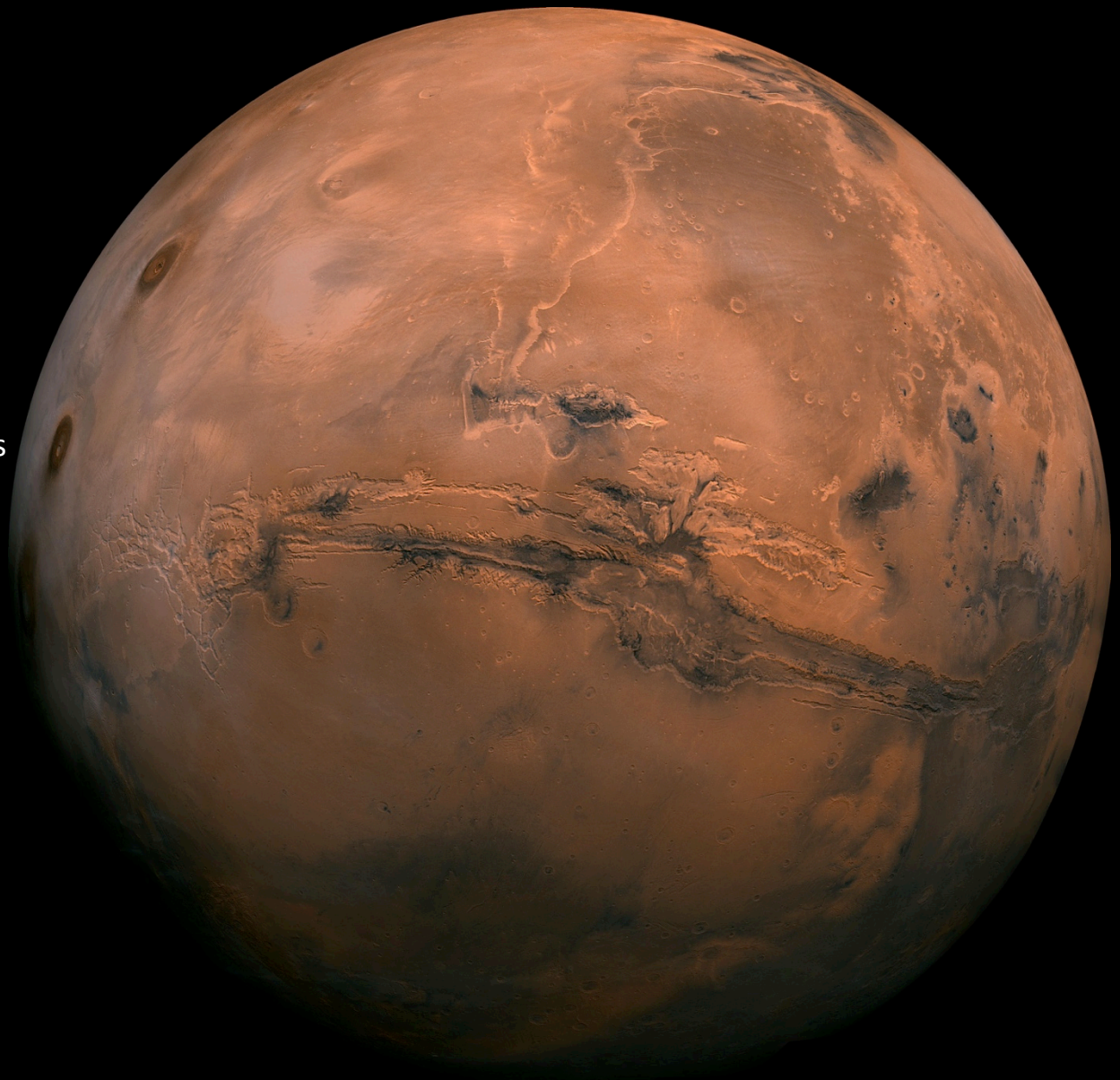
Magnetosphere

- No magnetosphere
- Southern Hemisphere crust highly magnetic
- Indicates magnetosphere 4 billion years ago

Rick Stankiewicz

Geology & Surface Features

- Northern hemisphere mostly flat plains, newer features
- Southern hemisphere ridges and craters – thicker crust with older features
- iron oxide soil
- Obvious signs of past active geology
- Huge volcanoes: Olympus Mons – 3 x taller than Mount Everest
- Polar ice caps
- Ancient river valley networks, deltas and lakebeds
- Rocks and minerals on the surface that could only have formed in the presence of water
- Evidence for huge floods 3.5 million years ago
- briny water seasonally flows down hillsides and craters
- Valles Marineris – 4,800 km long, 320 km wide, 7 km deep



NASA/JPL

Exploration

- Galileo first to observe with telescope
- Percival Lowell and his canals
- Most explored planet outside Earth
- ~ 8 month trip
- Six rovers: Sojourner, Opportunity, Spirit, Curiosity, Perseverance & Ingenuity, Zhurong
- 18 orbiters
- 21 landers
- United Arab Emirates' Hope Orbiter - 2021

Brian Colville

BRIEF TIMELINE OF

IMPORTANT MISSIONS TO MARS

1965: MARINER 4
NASA's Mariner 4 arrives and sends 21 photos of Mars back to Earth.

1971: MARS 3
The USSR's Mars 3 lander completes a soft landing on Mars, but is lost after several seconds transmitting from the surface.

1971: MARINER 9
NASA's Mariner 9 discovers volcanoes and Valles Marineris in the thousands of photos it sends back from Mars orbit.

1976: VIKING 1 AND VIKING 2
NASA's Viking 1 and Viking 2 both arrive and send their landers to the surface. Each spacecraft returns years of data but cannot prove the existence of microorganisms on Mars.

1997: MARS GLOBAL SURVEYOR
NASA's Mars Global Surveyor arrives in orbit around Mars and maps the Red Planet from pole to pole.

1997: PATHFINDER LANDER AND SOJOURNER ROVER
NASA's Pathfinder lander and Sojourner rover arrive on the surface of Mars. Sojourner becomes the first rover to trundle around on another planet.

2001: MARS ODYSSEY
NASA's Mars Odyssey begins what eventually becomes more than two decades relaying data from Mars to Earth.

2003: MARS EXPRESS
ESA's Mars Express loses its lander, but the orbiter remains in service for at least 19 years.

2004: SPIRIT AND OPPORTUNITY ROVERS
NASA's Spirit and Opportunity, twin rovers, arrive on Mars and find evidence of past flowing water.

2006: MARS RECONNAISSANCE ORBITER
NASA's Mars Reconnaissance Orbiter arrives at the planet and begins relaying more data than any other Mars mission to date.

2012: CURIOSITY ROVER
NASA's Curiosity rover arrives at the Gale Crater to discover methane and organic compounds in the crust.

2014: MARS ORBITER MISSION
India's Mars Orbiter Mission arrives.

2016: EXOMARS TRACE GAS ORBITER
ExoMars' Trace Gas Orbiter (TGO) provides insight about the composition of the Martian atmosphere. (Schiaparelli, its lander, was unsuccessful.)

2018: MARS INSIGHT LANDER
NASA's Mars InSight lander arrives to probe the interior structure of Mars in detail for the first time.

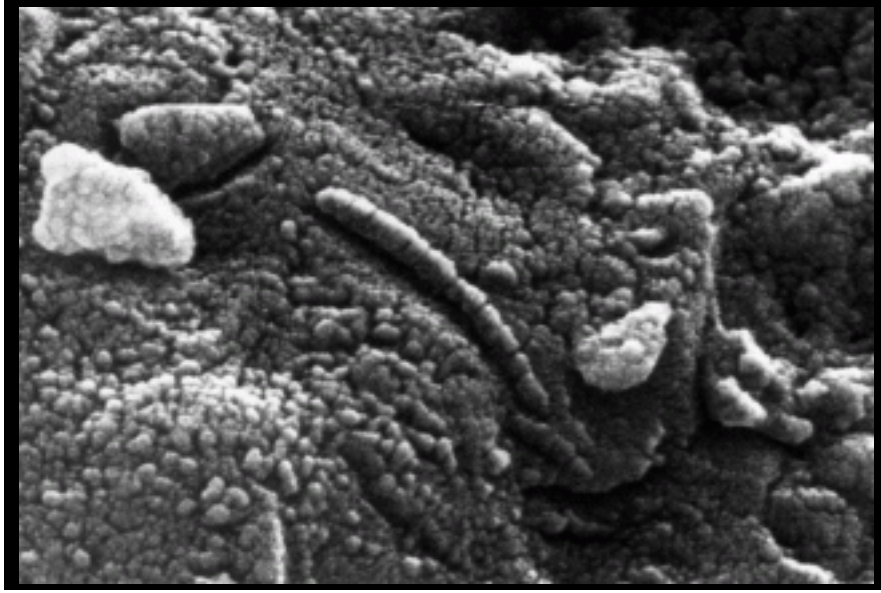
2021: HOPE ORBITER
The UAE's first interplanetary mission, the Hope

Future

Life in our Solar System

- Mars
- ALH84001,0: 4.5 billion years old
- Impact on Mars 16 million years ago
- Fell in Antarctica 13 thousand years ago
- Contains organic carbon that can be formed from non-biological processes
- Fossilized microbes ?

NASA/JSC/Stanford University



NASA

Novice Astronomy Class
February 6, 2006
Aliens: Is Anyone Out There?