

National Aeronautics and  
Space Administration



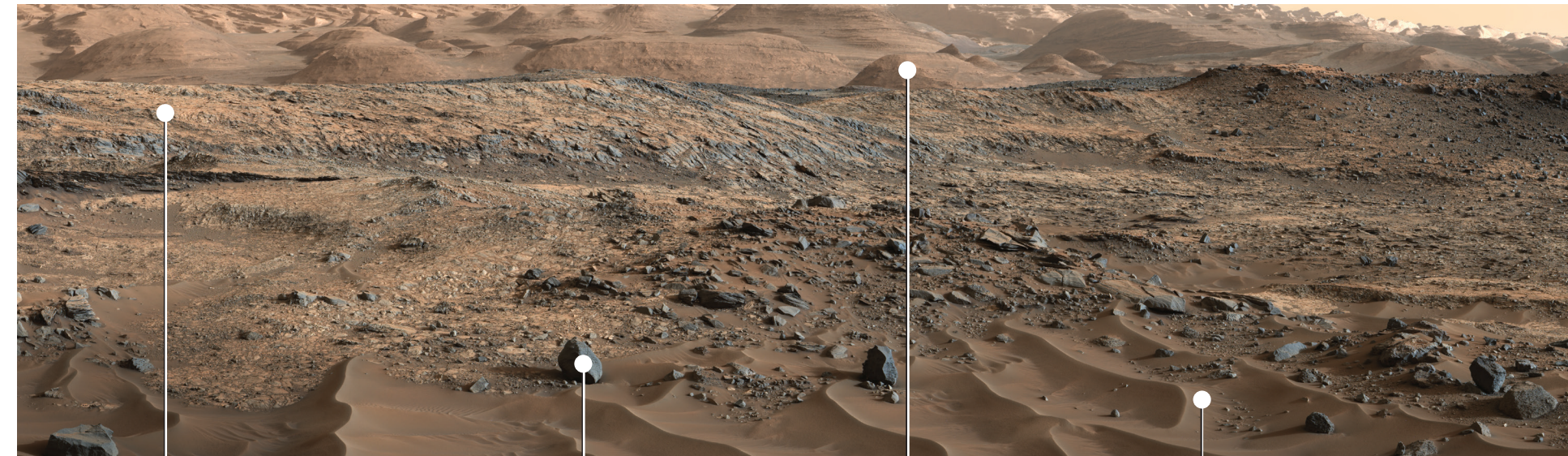
Curiosity | NASA's JOURNEY TO MARS  
Mars Science Laboratory



## Curiosity's Mission: Was Mars Ever Habitable?

NASA's Curiosity rover landed in Gale Crater on August 6, 2012 (UTC). It is exploring the Red Planet as part of the Mars Science Laboratory mission. Curiosity's main objective is to determine whether Mars could have supported small life forms called microbes. Microbes were among the first life forms on Earth, and are the most abundant living things on our planet. Could microbial life have thrived on Mars, too?

Early in its mission, Curiosity found signs that fresh water was abundant, including an ancient streambed and minerals that formed in water over long periods of time.



Sol 953 Mastcam mosaic  
Credit: NASA/JPL-Caltech/MSSS

Layer-by-layer changes in the texture and composition of the mountain record the evolving environmental conditions of early Mars. Rock layers at the top formed later than rock layers at the bottom. This fine-grained, dust-covered mudstone is the rock that forms the base of Aeolis Mons. It likely was deposited as sediment within an ancient, crater-filling lake.

These dark boulders may be remnants of ancient sand sheets (later turned into sandstone) that once covered this area, but now have been eroded away by wind.

These rounded buttes on Aeolis Mons contain sulfate minerals, perhaps indicating a change in the availability of water when they formed.

Curiosity has encountered small, sandy ripples like these along its traverse. In some cases, they cause the rover to lose traction, posing a hazard to driving.

The long-term presence of water is key to carrying out life's functions. Curiosity also found chemical elements common in living things, and carbon-based molecules that are necessary for life as we know it. With its Prime Mission successfully completed, Curiosity is now in its Extended Mission.

## Curiosity's Landing Site: Gale Crater

After an eight-month trip of about 354 million miles (570 million kilometers), Curiosity landed safely in Gale Crater. Mission engineers pioneered the use of precision-landing techniques. These included steering the spacecraft as it flew through the atmosphere before deploying a

parachute, then landing using a rocket-powered "sky crane" system. The new techniques enabled a controlled landing within a drop zone four times smaller than previous missions: 4 miles by 12 miles (about 7 kilometers by 20 kilometers).

Gale Crater is 96 miles (154 kilometers) wide. The 3-mile-high (~5-kilometer-high) Aeolis Mons ("Mount Sharp") rises like the peak of a sombrero at its center. The mountain contains layers of sedimentary rock laid down over time by water and wind. Each layer records information about the climate conditions and geological events occurring as the layer formed. Curiosity is exploring these layers to see which past environments could have supported life.

## Quick Facts

**Launch** — November 26, 2011 from Cape Canaveral, Florida, on an Atlas V-541

**Arrival** — August 6, 2012 (UTC)

**Prime Mission** — August 2012 through September 2014

**Extended Mission** — October 2014 onward

## Extended Mission Objectives

- Search for additional environments that may have been suitable for microbial life and for preserving evidence of organic molecules
- Characterize the chemical and mineral composition of rocks and soil, including organic molecules
- Study the role of water and changes in the Martian climate over time
- Characterize the radiation environment for future human missions to Mars

## Science Instruments

### Remote Sensing

**Mastcam** — Mast Camera

**ChemCam** — Chemistry and Camera

**MARDI** — Mars Descent Imager

### Contact Instruments (Arm)

**APXS** — Alpha Particle X-Ray Spectrometer

**MAHLI** — Mars Hand Lens Imager

### Analytical Laboratory (Rover Body)

**SAM** — Sample Analysis at Mars

**CheMin** — Chemistry and Mineralogy

### Environmental Instruments

**REMS** — Rover Environmental Monitoring Station

**RAD** — Radiation Assessment Detector

**DAN** — Dynamic Albedo of Neutrons

### Rover Size

**Length** — 10 feet (3 meters), not including the 7-foot (2.1-meter) arm

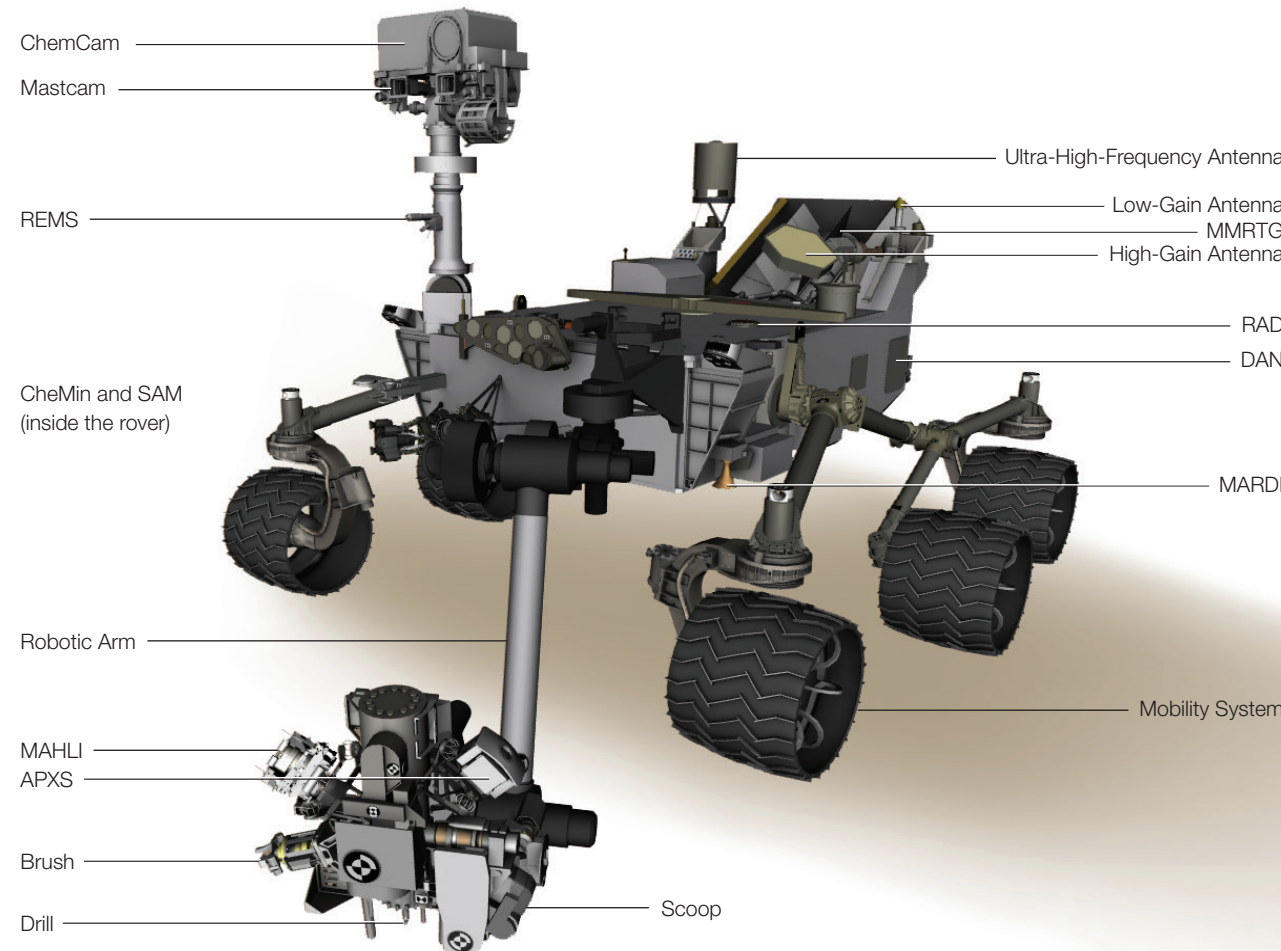
**Width** — 9 feet (2.8 meters)

**Height** — 7 feet (2.1 meters) tall

**Weight** — 2000 pounds (900 kilograms)

### Heating and Electrical Power

**Radioisotope Power System** — a Multi-Mission Radioisotope Thermoelectric Generator (MMRTG)



## The Rover

The size of a small car, Curiosity has six wheels to carry it over rough and varied terrain, from ancient riverbeds to the layered deposits of Mount Sharp. The rover has 10 advanced science experiment packages, including one with a laser that zaps rocks to reveal their chemical content. Several of its instruments are deployed on the tip of a long robotic arm, and three of its camera systems are mounted on a 7-foot-tall (~2-meter-tall) mast. A drill collects powdered rock samples for analysis by the two miniaturized laboratories onboard. The rover communicates all engineering and scientific data back to Earth through three radio antennae.

Curiosity aids in NASA's Journey to Mars, in which robots make key discoveries and test novel technologies to pave the way for astronauts to go to Mars.

## More Information

[mars.jpl.nasa.gov/msl](http://mars.jpl.nasa.gov/msl)

[www.nasa.gov/msl](http://www.nasa.gov/msl)

[Facebook.com/MarsCuriosity](https://www.facebook.com/MarsCuriosity)

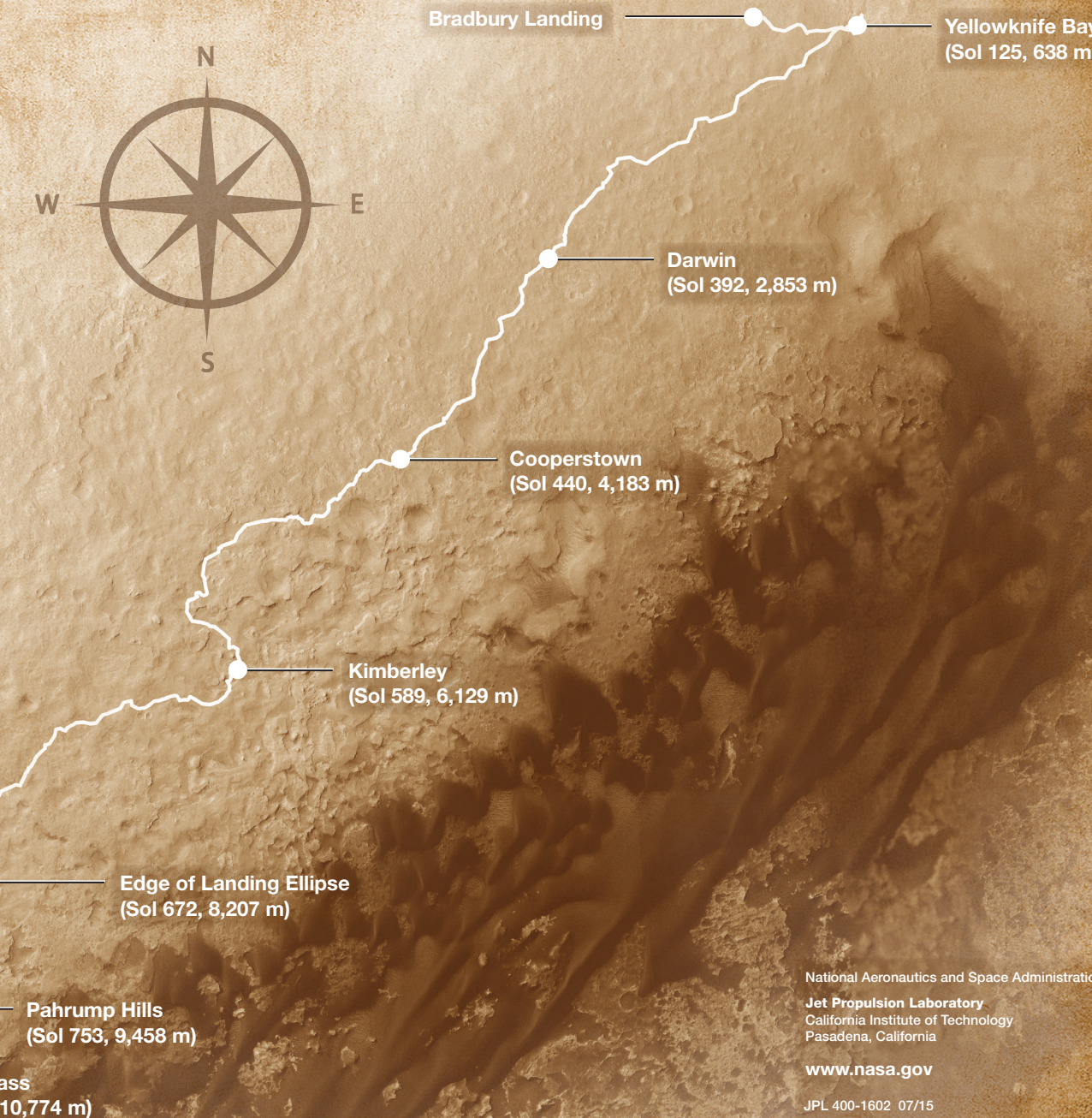
[Twitter.com/MarsCuriosity](https://twitter.com/MarsCuriosity)

[www.nasa.gov/topics/journeytomars](http://www.nasa.gov/topics/journeytomars)

The Jet Propulsion Laboratory, a division of the California Institute of Technology, manages the Mars Science Laboratory mission for NASA's Science Mission Directorate.

Curiosity discovered that Gale Crater once had environmental conditions suitable for supporting microbial life.

- In just her first year, Curiosity traversed a dry streambed to reach Yellowknife Bay, where drilled samples revealed evidence of an ancient freshwater lake, key chemical elements used by life, and potential energy sources microbial life needs to fuel metabolism.
- As the rover journeyed to Mount Sharp, analyses of those samples revealed organic molecules (the chemical building blocks of life) and nitrates (a vital source of nutrients for living things).
- Scientists also developed a revolutionary technique to determine the duration that surface materials may have been exposed to harmful radiation. That information helps them in their search for organic molecules.
- The rover continues to explore the layers of Mount Sharp for more clues about the potential for microbial life in its ancient past.



National Aeronautics and Space Administration  
Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California

[www.nasa.gov](http://www.nasa.gov)

JPL 400-1602 07/15