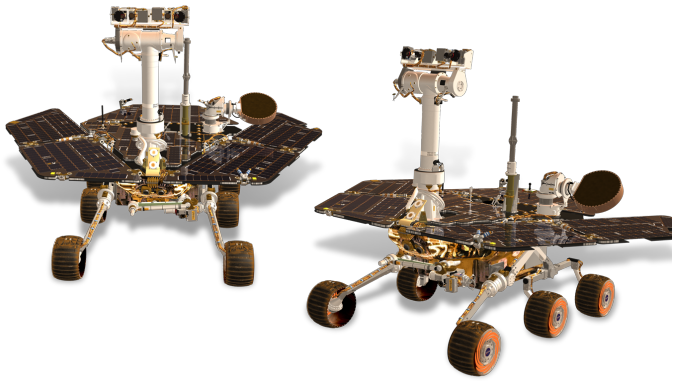
MARS Exploration Rovers

The Adventure Twins

Spirit and Opportunity landed on Mars January 3 and January 24, 2004 PST (Jan. 4 and Jan. 25 UTC). Both rovers lived well beyond their planned 90-day missions. Opportunity worked nearly 15 years on Mars and broke the driving record for putting the most miles on the odometer.



The twin geologists, Spirit and Opportunity, have both found dramatic evidence that:

- Long ago Mars was wetter
- Conditions at Mars could have sustained microbial life, if any existed

With data from the rovers, mission scientists have reconstructed an ancient past when Mars was awash in water. Spirit and Opportunity each found evidence for past wet conditions that possibly could have supported microbial life.

Star Performers

Both rovers exceeded their planned 90-day mission lifetimes by many years. Spirit lasted 20 times longer than its original design until it concluded its mission in 2010. Opportunity has worked on Mars longer than any other robot—nearly 15 years. The rover last communicated with Earth on June 10, 2018, as a planet-wide dust storm blanketed the solar-powered rover's location on Mars. In 2015, Opportunity broke the record for extraterrestrial travel by driving more than the distance of a marathon, with a total of 28.06 miles (45.16 kilometers).

First among the mission's scientific goals was to search for and characterize a wide range of rocks and soils for clues to past water activity on Mars. The rovers were targeted to sites on opposite sides of Mars that looked like they were affected by liquid water in the past. Opportunity landed at Meridiani Planum, a possible former lake in a giant impact crater. Spirit landed at Gusev Crater, a place where mineral deposits suggested that Mars had a wet history.

Each rover bounced onto the surface inside a landing craft protected by airbags. When they stopped rolling, the airbags were deflated and the landing craft opened. The rovers rolled out to take panoramic images. These images gave scientists the information they needed to select promising geological targets to tell part of the story of water in Mars' past. Then, the rovers drove to those locations and beyond to perform close-up scientific investigations.

Mars Exploration Rovers
Top Science Findings

Salty Water

Warmer Climate

Watery Past

Ancient Volcano

Past Flowing Waters

Right Conditions for Life

Science

Instruments on the Mars Exploration Rovers

Panoramic Camera

PANCAM

for determining the mineralogy, texture, and structure of the local terrain.

Miniature Thermal Emission Spectrometer

for identifying promising rocks and soils for closer examination and for determining the processes that formed Martian rocks. The instrument is designed to look skyward to provide temperature profiles of the Martian atmosphere.

Mössbauer Spectrometer

MB

for close-up investigations of the mineralogy of iron-bearing rocks and soils.

Alpha Particle X-Ray Spectrometer

APXS

for close-up analysis of the abundances of elements that make up rocks and soils.

Magnets

MAGNETS

for collecting magnetic dust particles. The Mössbauer Spectrometer and the Alpha Particle X-ray Spectrometer were designed to analyze the particles collected and help determine the ratio of magnetic particles to non-magnetic particles. They also analyze the composition of magnetic minerals in airborne dust and rocks that have been ground by the Rock Abrasion Tool

Microscopic Imager

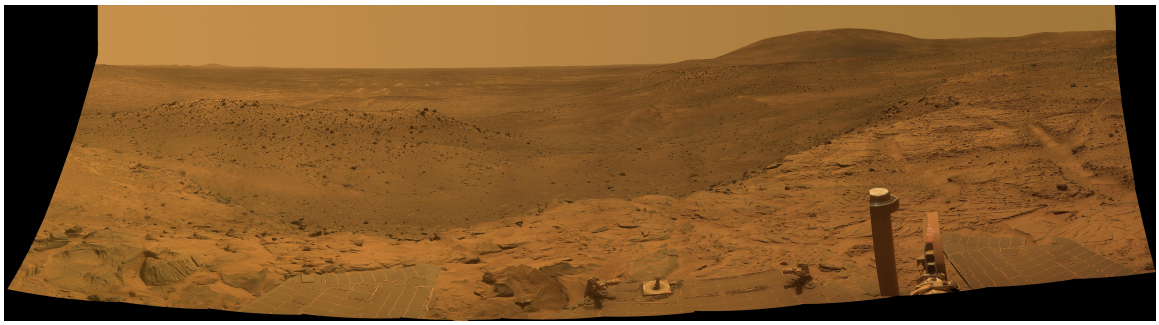
MI

for obtaining close-up, high-resolution images of rocks and soils.

Rock Abrasion Tool

for removing dusty and weathered rock surfaces and

exposing fresh material for examination by instruments onboard.



All the Right Moves

Each rover was created to be the mechanical equivalent of a geologist walking from place to place. The mast-mounted cameras are 5 feet (1.5 meters) high and provide 360-degree two-eyed, humanlike views of the terrain. The robotic arm moves like a human arm with an elbow and wrist, and can place instruments directly up against rock and soil targets of interest. The mechanical "hand" of the arm holds a microscopic camera that serves the same purpose as a geologist's handheld magnifying lens. The Rock Abrasion Tool is like a geologist's rock hammer that exposes the insides of rocks.