MSL PAYLOAD

SCIENCE PAYLOAD

Remote Sensing

Mastcam (M. Malin, MSSS)—Color and telephoto imaging, video, atmospheric opacity
ChemCam (R. Wiens, LANL/CNES)—Chemical composition; remote micro-imaging

Contact Instruments (Arm)

MAHLI (K. Edgett, MSSS)—Hand-lens color imaging
APXS (R. Gellert, U. Guelph, Canada)—Chemical composition

Analytical Laboratory (Rover Body)

SAM (P. Mahaffy, GSFC/CNES)—Chemical and isotopic composition, including organics
CheMin (D. Blake, ARC)—Mineralogy

Environmental Characterization

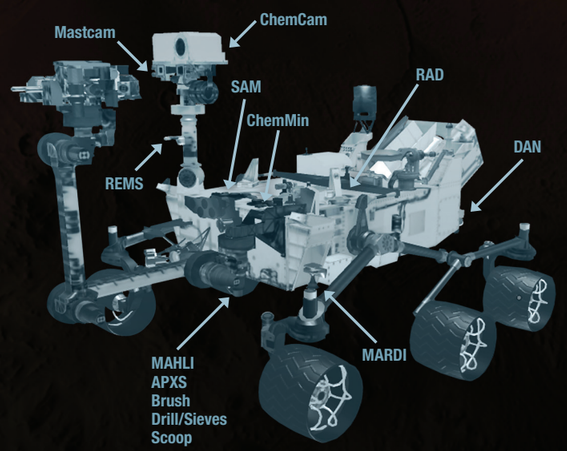
MARDI (M. Malin, MSSS)—Descent imaging
REMS (J. Gómez-Elvira, CAB, Spain)—Meteorology/UV
RAD (D. Hassler, SwRI)—High-energy radiation
DAN (I. Mitrofanov, IKI, Russia)—Subsurface hydrogen

ENGINEERING PAYLOAD

Entry Descent & Landing Sensors

MEDLI (F. McNeil Cheatwood, LANL)—Measures performance of the MSL heatshield and atmospheric conditions during entry and descent at Mars

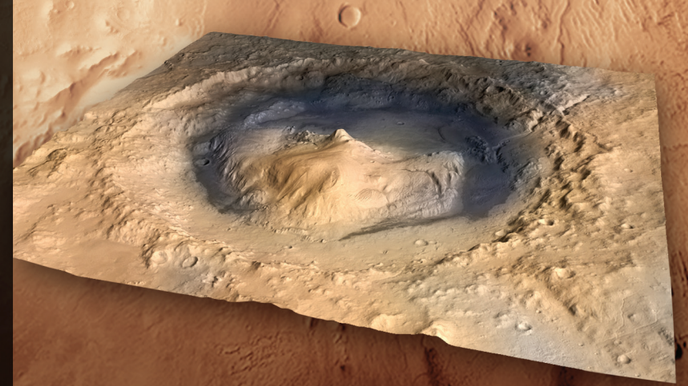
CURIOSITY INSTRUMENTS



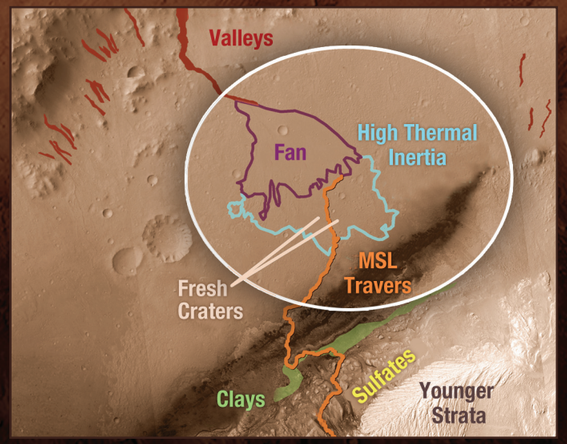
NP-2012-03-850-HQ

Gale Crater is a fascinating place to explore because of the mountain of layered materials in the middle—a mound about 3 times as high as the rim of the Grand Canyon (5 km/3 miles) on Earth! The layers tell a story about what Mars was like in the past, perhaps spanning much of the early history of the Red Planet. Studies from orbit have revealed that the layers have different minerals depending on their height. Near the bottom of the mound are clay minerals. Above the clay-bearing layers are layers with minerals containing sulfur and oxygen. These different layers represent different environmental histories of Mars.

To get to the mound, the Curiosity rover will land on a flatter part of the crater and carefully work its way upward, layer by layer. Along the way, Curiosity will traverse over sediments formed in the wetter and warmer environment of early Mars to sediments formed as the planet's environment transitioned to the cold dry Mars of today.



Landing-Site Geology



For more information about Gale crater go to:

www.nasa.gov/msl
http://mars.jpl.nasa.gov/msl/multimedia/videos

National Aeronautics and Space Administration

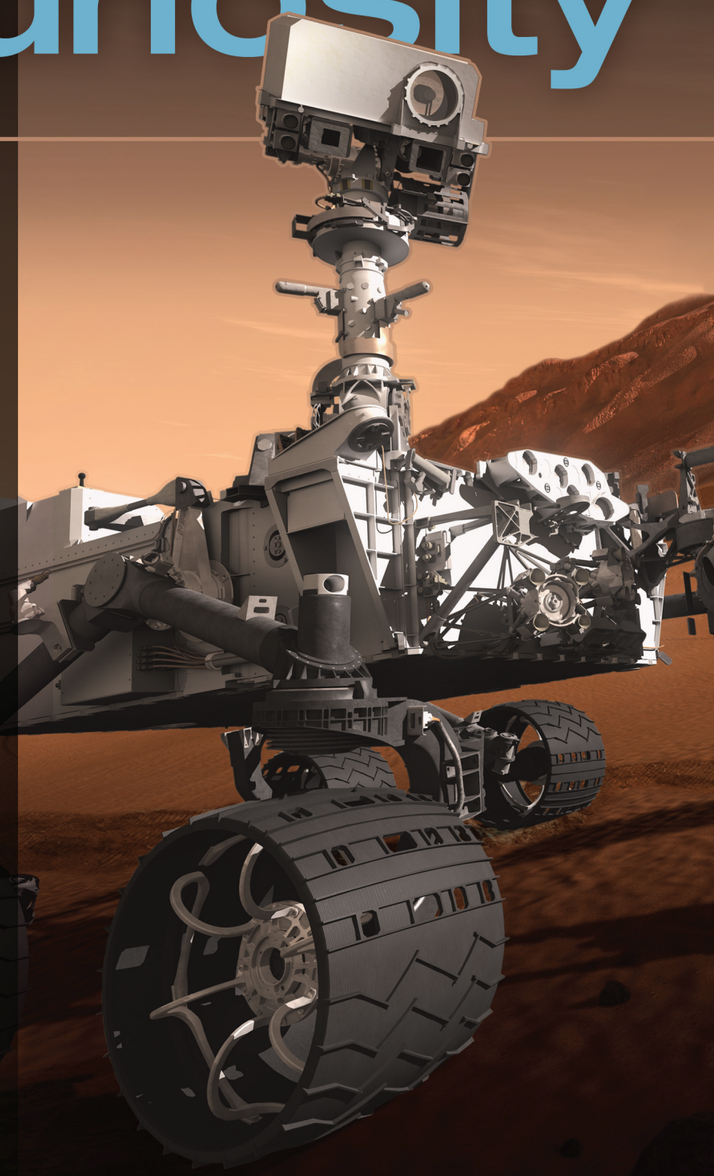
MSL/Curiosity

The Next Mars Rover

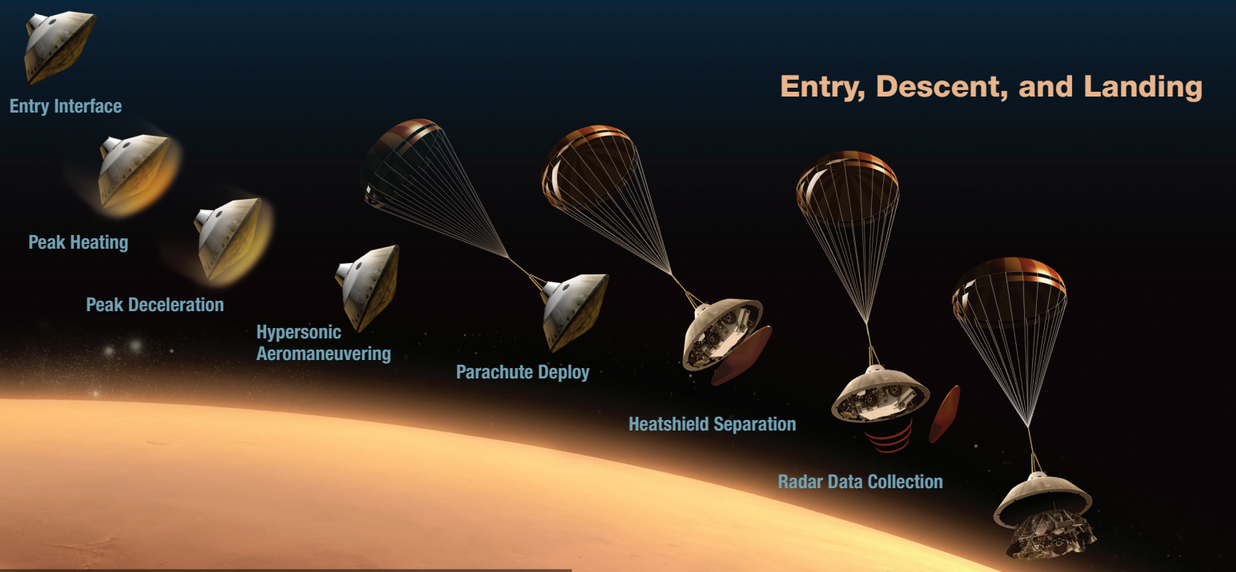
SEEKING SIGNS OF LIFE

NASA's Mars Exploration Program has been created to undertake the long-term robotic exploration of Mars, the Red Planet. The Mars Science Laboratory (MSL) project is the next mission in a series of explorations intended to unlock the history of Mars. Part of MSL is a mobile robotic rover, appropriately named *Curiosity*, which is designed for conducting an in-depth investigation of Mars' past or present ability to sustain microbial life. In essence, the mission is to determine the planet's "habitability." *Curiosity* is larger and can travel farther than *Spirit* and *Opportunity*, NASA's two Mars Exploration Rovers that began exploring the Red Planet in early 2004. *Curiosity* will carry the biggest, most advanced suite of instruments for scientific studies ever sent to the martian surface. The rover will analyze dozens of samples scooped from the soil, drilled from rocks, and pulled from the atmosphere. The record of the planet's climate and geology is essentially "written in the rocks and soil"—in their formation, structure, and chemical composition. The rover's onboard laboratory will study the samples and the local geologic setting in order to detect chemical building blocks of life (e.g., forms of carbon) on Mars. It will assess what the martian environment was like in the past, addressing the fundamental question, "Was Mars ever a habitat for microbial life?"

www.nasa.gov



Entry, Descent, and Landing



THE ARRIVAL

The MSL spacecraft will make a dramatic entry into the martian atmosphere and then descend on a parachute. Next, a descent stage carrying *Curiosity* will drop away and slow itself further with small rocket engines. Hovering just above the Mars surface, the descent stage will become a "sky crane" as it lowers the rover on a tether to the surface, where *Curiosity* will land on its wheels. On the surface, the rover will be able to drive over obstacles up to 75 centimeters (29 inches) high and travel up to 140 meters (475 feet) per hour. On average, *Curiosity* is expected to travel about 200 meters (656 feet) per driving day, depending on power levels, slippage, steepness of the terrain, visibility, and the engineering tasks and science investigations that it may be assigned.

Arriving at Mars in August 2012, MSL will serve as a beginning towards the next decade of Mars exploration, representing a huge step in Mars surface science and exploration capability by:

- Demonstrating the ability to land a metric-ton-class rover on the surface of Mars.
- Demonstrating the ability to land much more precisely than previous missions.
- Demonstrating long-range mobility for collection of more diverse samples and performing a wider array of studies.
- Demonstrating reliable, long-lived power systems necessary for future missions exposed to the extreme environments of space and planetary surfaces.

Sky Crane represents the use of a new "soft-landing" technique employed at Mars. The sheer mass of MSL prevents engineers from using the familiar airbags to deliver their rover safely to the martian surface. When the vehicle has been slowed to nearly zero velocity, the rover will be released from the descent stage. A bridle and "umbilical cord" will lower the rover to the ground. When the on-board computer senses that touchdown is successful, it will cut the bridle and fly away, leaving the rover on the surface.

	Sojourner	Spirit & Opportunity	Curiosity
Rover Mass	10.5 kg	174 kg	950 kg
Driving Distance (req't/actual)	10 m/102 m	600 m/31.468 m	20,000 m/TBD
Mission Duration* (req't/actual)	10 sols/83 sols	90 sols/2886 sols†	668 sols/TBD
Power/Sol*	0.016 kWhr	0.499-0.590 kWhr	~2.5 kWhr
Instruments/Mass	1/<1.5 kg	7/5.5 kg	10/75 kg
Data Return*	2.9 Mb/sol	50–150 Mb/sol	As needed
EDL	Ballistic Entry	Ballistic Entry	Guided Entry

*1 sol = 1 Martian day

† Mission duration for Opportunity as of March 2012

WHY IS IT CALLED *CURIOSITY*?

The rover's name originated from the "Name NASA's Next Mars Rover" contest that resulted in thousands of essays submitted by students ages 5 through 18 from American schools. The essay written by twelve-year old Clara Ma, a sixth grader from Lenexa, Kansas, was chosen from more than 9,000 proposals entered. In her essay, Clara best defined her idea for the name "*Curiosity*" as "an everlasting flame that burns in everyone's mind." As winner of the MSL rover naming contest, Clara can be proud in knowing her suggestion will leave an indelible mark in the minds of many—and on the largest, most sophisticated rover ever sent to Mars.

Clara Ma's essay: www.nasa.gov/msl

LAUNCH AND LANDING PROFILE

Mars Launch Date: Nov 26, 2011, 10:02 a.m. EST (7:02 a.m. PST)

Location: Cape Canaveral Air Force Station, Florida

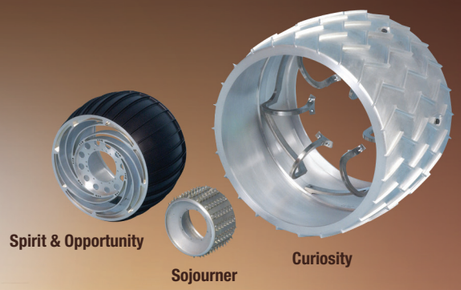
Vehicle: United Launch Alliance Atlas V 541

Mars Landing Date: Aug 6, 2012, 1:30 a.m. EDT

To view an animation of the landing go to: http://mars.jpl.nasa.gov/msl/multimedia/videos

MSL Objectives Include:

- Assessing biological potential of the martian site
- Characterizing geology and geochemistry
- Investigating the role of water, atmospheric evolution and climate
- Characterizing the spectrum of surface radiation



NASA's Mars rovers keep getting more sophisticated and bigger! *Sojourner*, the first rover on Mars was very small and didn't go far. *Spirit* and *Opportunity* are much bigger and have driven many times farther than expected. *Curiosity* represents an even bigger leap in capability and will be able to carry its on-board chemistry lab long distances.