Critical Science on NASA's Mars Reconnaissance Orbiter

CRISM

Compact Reconnaissance Imaging Spectrometer for Mars

Searching for Clues

The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) is a main science instrument on NASA's Mars Reconnaissance Orbiter, which has been conducting an in-depth study of the Red Planet since 2006. CRISM plays a critical role in exploring Mars and has helped scientists discover details of the planet's watery past. It has also helped identify the best landing sites for future missions seeking traces of past or present life on Mars.

The High-Tech Detective

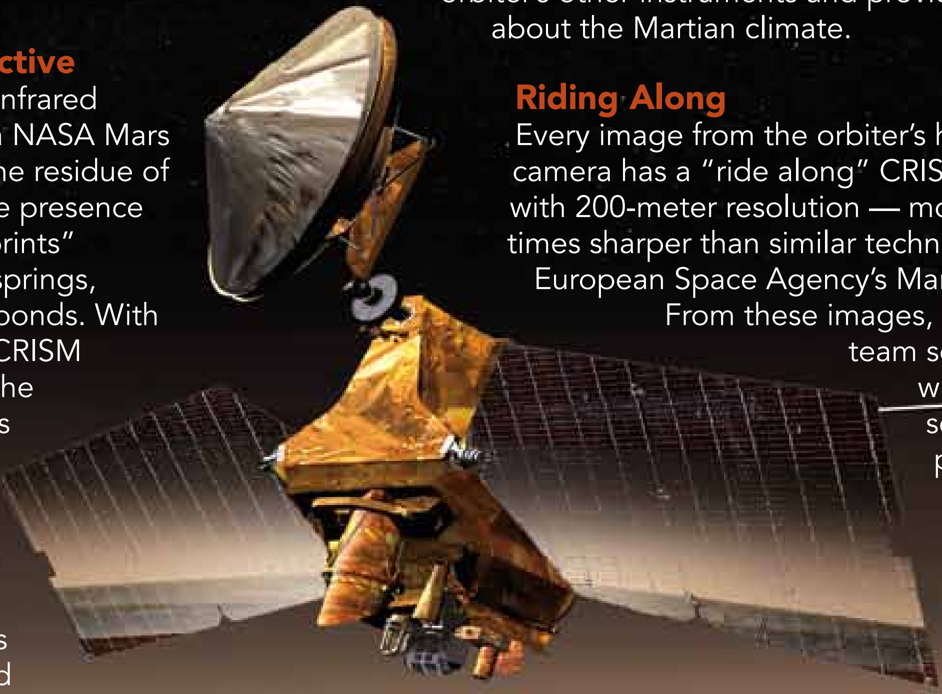
CRISM, the first visible-infrared spectrometer to fly on a NASA Mars mission, is looking for the residue of minerals that form in the presence of water — the "fingerprints" left by evaporated hot springs, thermal vents, lakes or ponds. With unprecedented clarity, CRISM is mapping regions on the Martian surface at scales as small as 60 feet (about 18 meters) across, when the spacecraft is 186 miles (300 kilometers) above the planet. CRISM reads 544 "colors" in reflected sunlight to detect certain minerals on the surface — including the signature traces of past water.

CRISM in Orbit

CRISM's scanning mechanism allows it to track regions on the surface as the orbiter flies above, mapping hundreds of miles in a matter of minutes. CRISM spent the first half of the orbiter's two-year primary science orbit mapping Mars at a 650-foot (200-meter) scale, searching for potential study areas. CRISM is also characterizing seasonal variations in the atmosphere and in surface materials, supplementing data gathered by the orbiter's other instruments and providing new clues about the Martian climate.

Riding Along

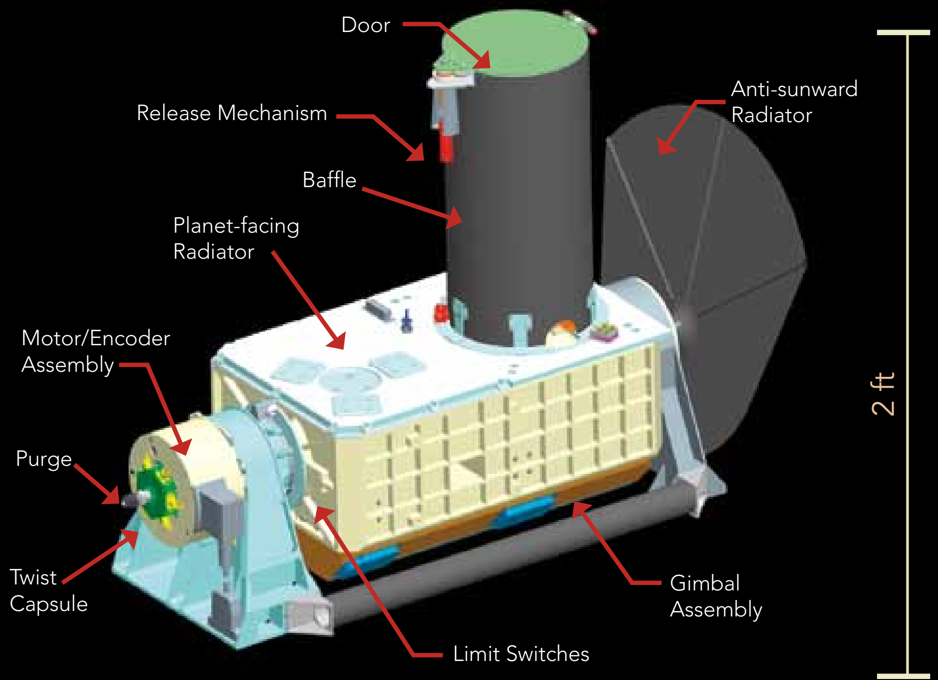
Every image from the orbiter's high-resolution camera has a "ride along" CRISM observation with 200-meter resolution — more than eight times sharper than similar technology on the European Space Agency's Mars Express. From these images, the mission team selects regions with the highest scientific priority, to cover with the full capability of the instrument.



CRISM – a key science instrument on NASA's Mars Reconnaissance Orbiter – has helped scientists find sites where water once existed and where future Mars landers should study.

A True Explorer

The Mars Reconnaissance Orbiter mission is a big step in exploring and understanding Mars. CRISM has improved significantly on the mapping technology that previously orbited the planet — not only identifying future landing sites, but also providing details on sites the Mars Exploration Rovers are roaming now. The mission has returned more data about the Red Planet than all other Mars missions combined — CRISM alone has generated over 22 terabytes of processed data, enough to fill more than 33,000 compact discs.



An Expert Team

The CRISM team includes expertise from universities, government agencies and small businesses in the United States and abroad. Principal Investigator Scott Murchie, of The Johns Hopkins University Applied Physics Laboratory (APL), heads the CRISM project. APL, which has built more than 150 spacecraft instruments over the past four decades, led the effort to develop, integrate and test CRISM.

CRISM's co-investigators are top planetary scientists from Brown University, the Jet Propulsion Laboratory, Arizona State University, Space Science Institute, Washington University in St. Louis, University of Paris, the Applied Coherent Technology Corporation, United States Geological Survey, University of Nevada, and NASA's Goddard Space Flight Center, Ames Research Center and Johnson Space Center.

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

COOL Engineering

The CRISM team's toughest technical challenge was figuring out a way to keep the instrument's insides cool. CRISM's infrared detector operates at around minus 240 degrees Fahrenheit (minus 150 degrees Celsius), much colder than other sections of the instrument. A space-facing radiator plate pulls some heat from the structure, but three small cryocoolers carry much of the workload. To make sure the short-lived coolers last the entire mission, they're isolated from each other and fitted to tiny diode heat pipes, which regulate the surrounding temperature so only one cooler operates at a time.

On the Web

CRISM: http://crism.jhuapl.edu
NASA Mars Exploration: http://mars.jpl.nasa.gov

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