The Chemistry and Camera (ChemCam) instrument is the first to use a laser to measure the chemical composition of the surface of another planet. Using its laser, ChemCam zaps rocks (called targets), producing spectra that reveal the “chemical fingerprints” of different elements present in the rocks on Mars. The camera on ChemCam takes up-close images of the laser’s targets showing fine-scale details. The camera has the capability of imaging objects as small as a pinhead from a distance of 33 feet! Spectra and images obtained by ChemCam are helping scientists understand the geologic history of the surface of Mars.

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The “Fingerprints” of Rocks and Soils on Mars

Sparks produced when ChemCam zaps rocks are bright (left). When captured in ChemCam’s spectrometers, light from a spark reveals the elements contained in the rock, its “chemical fingerprint,” and is displayed in a spectrum. The spectrum below, from the first rock targeted on Mars, indicates that the dust on the rock contains hydrogen (inset), i.e., the dust is hydrated. Water in soils could potentially be used by future human missions to the planet Mars.

Fluorine-Rich Minerals
ChemCam is the first instrument to discover fluorine on Mars. This element indicates that some of Mars’ magmas have lower temperatures—more Earthlike—than previously thought.

Calcium Sulfates
This compound was deposited in fractures in the rock some time after the rocks were formed and fractured.

Manganese Oxides, Copper, Zinc
These elements were deposited by oxygen-rich groundwater, suggesting that the atmosphere of Mars was also oxygen rich and potentially more habitable than previously expected.

Deposited Silica
The silica mineral tridymite hints at the existence of ash from high-temperature volcanic eruptions, unexpected for Mars.

Olivine-Rich Dunes
Olivine weathers away rapidly in Earth’s water-rich environment, but is preserved in Mars’ dry climate.

Iron Sticks, Nodules
Iron-rich minerals hematite and magnetite appear to have been important in the formation of this ridge of hard rock.

Cobblestone Cliffs
The cliffs shown above are the result of differential weathering between a mosaic of rock types, with some grains being more susceptible to the effects of water.

Boron, Evaporites
Boron is a telltale remnant of a lake that has dried out. On Earth, boron may have been important in the development of early stages of life.

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