



New Mars rover to search for life

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Mars has always been a source of mystery, exciting the imaginations of sci-fi writers, filmmakers and the public. Recent scientific discoveries have simultaneously satisfied and stoked the flames of our curiosity about our nearest planetary neighbor.

A decade of research enabled by NASA's aptly-named Curiosity rover has revealed that lakes, rivers, streams and likely oceans appearing over eons are part of the geologic history of Mars. While its epoch of active bodies of water ended over 3 billion years ago, we know that Mars used to be habitable. So far, no clear evidence of life has been found there, not even a virus. But if Mars was once habitable, wouldn't it have harbored life?

NASA is now poised to take the next step to answer this question with the launch of the Perseverance rover.

The mission of this new rover is several-fold. Its primary and unique purpose is to collect samples that a future spacecraft can bring back to Earth. Every time a rover goes to Mars, it stays there, with no way to fly back home. No rock or soil samples have ever been brought back to Earth. This mission proposes to change that by caching rock and soil samples on the Martian surface for a future mission to bring home.

These samples will reveal more about the geologic history of Mars than anything previously learned, which is already a lot. Since 2012, the Curiosity rover has traveled more than a dozen miles, making observations with its 10 instruments. One of those, the ChemCam laser instrument, built in — and operated from — Los Alamos National Laboratory and France, has been zapping rocks, studying their chemical composition and helping to explain the nature of the large lake that once existed near Mars' equator. Other instruments study Mars' mineralogy and weather patterns.

In addition, data from the Curiosity rover's Sample Analysis at Mars instrument, or SAM, has shown that Mars does indeed have organic molecules. This is exciting because organic molecules make up our own bodies — but they can also be made by nonliving processes. Do the organics on Mars originate from life?

That's precisely why gathering the most interesting samples and bringing them back to Earth is so important. The robotic instruments that have been sent to these far-flung destinations have become more advanced over the decades, but they can't match the laboratory instruments on Earth. Researchers expect to find out much more about Mars once they get samples back from the Perseverance mission at a future date.

In the meantime, this rover is going to find the samples. Once again, the rover sports a rock-zapping laser instrument, this time called SuperCam (the next-generation ChemCam), again developed in part at Los Alamos. Its laser, true to the New Mexico

state question, sports both red and green beams. In addition to the laser shots that provide chemical compositions of the rocks, two other techniques give complementary information on their mineral content (the way the elements are bound together as molecules).

Meanwhile, a microphone will listen to the snap of the laser impacts to tell the Perseverance team how hard the rocks are — another important detail both for rover operations and to interpret the geological setting. Not to mention that the microphone will provide first-ever recordings of the Martian surface, so we can listen to the wind and any other sounds the environment might offer.

On the arm of the rover, the SHERLOC instrument also claims ChemCam heritage, specifically for its detector and electronics, which hail from Los Alamos National Laboratory. A fine-scale probe looking at just a few microns at a time, SHERLOC will search for organic molecules that might be signs of life.

Perseverance successfully launched July 30, with NASA managing to safely continue these preparations this spring and summer. If all goes according to plan, Perseverance will land on Mars on Feb. 18, 2021. A busy time of exploration and discovery will follow, with the scientific community and the public eagerly awaiting results.

To coincide with the launch of the Rover, the Laboratory has launched a podcast, Mars Technica, exploring some of the technology on the spacecraft, with insights straight from scientists behind it. [Learn more here.](#)

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