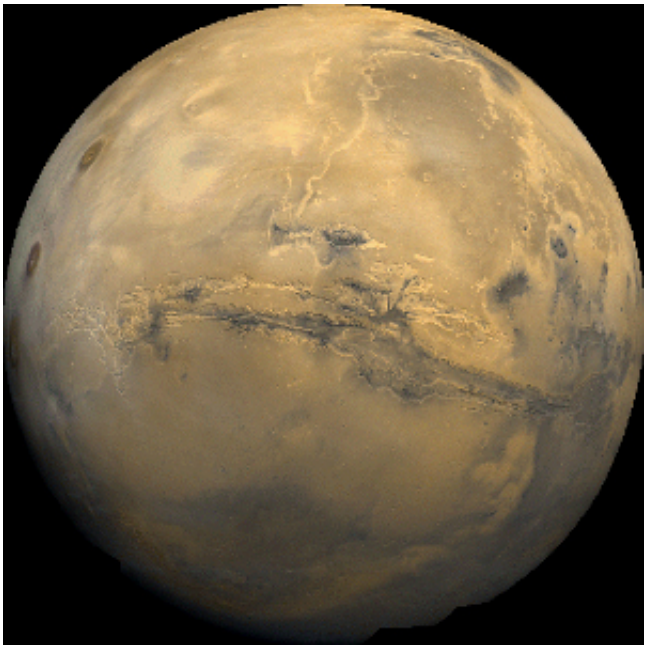
Professor helps craft marching orders for Mars rover

December 29 2014, by Katherine Long, The Seattle Times



Valles Marineris, Mars. Credit: NASA

These are exciting days for the earthbound scientists who study Mars. Data from a NASA rover creeping across the red planet's surface is rewriting our understanding of Mars' geological history and offering tantalizing clues to the possibility that the planet once harbored life - or, possibly, still does.

One of those scientists is Melissa Rice, who recently joined Western Washington University as an assistant professor of geology. She's part of

a team of 400 scientists nationwide guiding the rover Curiosity across the surface of Mars.

Rice, 32, takes a "rover shift" five times a month. In Bellingham, she receives high-resolution photos and other data from Curiosity's previous day on Mars. Then she discusses, via teleconference with several dozen other scientists, what they want the rover to do next. Several University of Washington professors are also involved in the effort.

The group decides which rocks the rover should investigate, how far the machine should drive each day and what other measurements it should take along the way. Once they've set a plan, the information is passed on to a NASA engineering team that sends commands to the rover.

Earlier this month, scientists reported Curiosity had recorded a burst of methane in Mars' atmosphere that lasted at least two months. One possible explanation: It's the waste product of microbes living below the surface.

"It's definitely not evidence for life on Mars and it doesn't necessarily make it more likely that there is," Rice said. "But a door that we thought had been closed actually is not."

Curiosity isn't designed to detect life on Mars, and if it found some remnants of ancient life, scientists might not even recognize it as such, Rice said.

Rather, the rover was designed to explore whether parts of Mars could have been habitable at some point. And Rice says the evidence is strong that Mars once had an environment more like Earth's - moist and warm, with an atmosphere that was robust enough to sustain liquid water at the surface.

"We've found really compelling evidence that the rover's landing site on Mars not only had water, but water that was not too salty, not too acidic, and that had the kinds of nutrients that might have been able to sustain life," she said.

The rover team spends much of its time comparing photos of Mars to similar-looking geological formations on Earth to try to deduce what happened on the planet's surface.

The rover's photographs show rock colors both visible and invisible to the human eye. A big part of Rice's graduate work was searching in databases for spectral patterns of Earth rocks, and matching those patterns to the rocks found on Mars. That's how scientists deduce the mineral composition of the rocks the rover encounters.

The next rover, planned for 2020, will try to answer whether there are signs of life on Mars, Rice said. That rover will collect samples of rocks and store them on the planet, so that a subsequent mission can retrieve them and return them to Earth.

Rice said scientists must perform experiments on Martian rocks in an earthbound lab so they can be repeated and verified.

"If we found some biosignature, the implications would be so profound, we would want to be absolutely sure it wasn't an instrument calibration," she said. "The only way you have that certainty is to repeat the experiment multiple times."

Next quarter, she's going to put her students to work on an assignment to pick out a prospective landing site for the 2020 rover - work that Mars scientists will actually be doing next year. All of the data needed to guide the decision on the landing is available on NASA's website, she said.

The rover is now at the base of Mount Sharp, and scientists believe the mountain contains clues to 3 billion years of Mars' history. Layers of rocks are expected to offer hints as to why its climate changed so dramatically.

Rice, who went to high school at Forest Ridge School of the Sacred Heart in Bellevue, first became interested in Mars while majoring in astrophysics at Wellesley College in Massachusetts. In graduate school at Cornell, she was trained on how to work with some of the earlier Mars rovers. She earned her Ph.D. at Cornell in 2012, where her thesis examined signs of water at the Gusev and Eberswalde craters on Mars.

In 2012, when the Curiosity rover landed, she was one of a team of scientists at the Jet Propulsion Laboratory in Pasadena, Calif., who kept their work schedules correlated with the Mars orbiter, so that they could be ready to pore over the data as soon as it arrived.

"I describe it as being constantly jet-lagged for three months," she said.

Rice said that for decades, many people believed there was life on Mars. American astronomer Percival Lowell, working in the late 1890s, popularized the idea that there were signs of Martian canals on the surface. It was only in the early 1960s that NASA's Mariner missions fully disproved Lowell's theories. Yet the idea that our neighbor in space once harbored some form of life still teases our imagination.

If life were to emerge independently on another planet tens of millions of miles from Earth, that could imply that planets harboring life area common phenomenon elsewhere in the universe, Rice said.

In other words, Mars might help us know whether we are alone in the universe, "which is probably one of the biggest questions one can ask," she said.