Michigan scientists bring special expertise to new rover mission

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Curiosity: The Next Mars Rover. Image courtesy of NASA/JPL-Caltech

(PhysOrg.com) -- Two University of Michigan planetary scientists are vital members of the science team of the Mars Science Laboratory, which will study whether the Red Planet was ever capable of harboring microbial life. It is scheduled to launch next week.

Planetary science professor Sushil Atreya, who helped conceive of the MSL mission, has been involved in the planning and execution of many of NASA's milestone planetary missions from the Voyager on. An expert on the solar system's chemistry and evolution, he is a co-investigator on the MSL's cornerstone lab, the Sample Analysis at Mars. He will be involved in the study of climate evolution and the search for organics---the building blocks of life.

Atmospheric and planetary science professor Nilton Renno will be

involved in monitoring Martian weather and assessing whether the environmental conditions are suitable for life. During the 2008 Mars Phoenix mission, Renno was the first to theorize that the globules photographed on the lander's leg were actually beads of liquid saltwater. Liquid water is an essential ingredient for life.

U-M's Space Physics Research Lab built the computer controls of the Sample Analysis at Mars instruments that Atreya will utilize.

"This mission is extremely important to me, and to all of us who seek to understand more about the habitability of Mars, which comes closest in our solar system to an Earth-like environment," Atreya said. "It is designed to answer some of the biggest and longest-standing questions we have about Mars."

Could Mars have ever harbored microbial life? Are organics preserved there today? How much liquid water did the planet hold in the past---perhaps an ocean's worth? This mission aims to give scientists answers to these and other questions.

Among the tasks before Atreya and the Sample Analysis at Mars (SAM) suite of instruments is to search for organics, carbon-based molecules that are the building blocks of life as we know it. The MSL rover named Curiosity will use SAM's mass spectrometer, gas chromatograph, and tunable laser spectrometer to analyze samples from air, soil and rock.

When the data from SAM is combined with that from other MSL instruments, scientists should be able to tell not just whether a molecule is organic, but if it came from a living or non-living source. Atreya expects the rover to find organics.

"Organics have been raining down on Mars from meteorites, comets and interplanetary dust particles for 4.5 billion years," Atreya said. "And

Mars probably has its own indigenous organics, whether they're connected with life or not."

"Mars Science Laboratory can investigate those habitable environments that might also preserve organics. However, preservation of organics on Earth is very uneven, so if they are not found at Curiosity's Gale Crater landing site, it might not necessarily indicate an absence elsewhere in the geologic record of Mars. But Gale Crater is a very attractive site to begin the search."

Renno is a co-investigator on the Rover Environmental Monitoring System, which is the mission's weather station. The instrument will measure the air and ground temperatures, wind speed and direction, atmospheric pressure, humidity, and ultraviolet radiation around the rover. This information will help scientists understand how the planet's ground and atmosphere interact, which could provide insights into whether Mars could support microbial life beneath thin layers of salts on its surface.

While it's not part of the official mission, Renno will be watching for any signs of subsurface ice, salts or brines at the landing site today or in the distant past. Certain salts would enable brines to form and stay liquid at the low Martian temperatures and atmospheric pressures.

"This is the most capable rover ever sent to Mars," Renno said. "It has extremely sensitive instruments capable of making unexpected discoveries."

The launch is planned for 10:25 a.m. Nov. 25 at Cape Canaveral. The launch window is until Dec. 18. The rover is scheduled to land on Mars in August 2012.