Robotic probe to seek Martian life with new focus

Irene Klotz

(Reuters) - This summer, a robotic geologist arrives on Mars to try out a new strategy for searching for life beyond Earth.

Rather than hunt for microbes like the Viking missions of the 1970s, NASA's Mars Science Laboratory, nicknamed Curiosity, will look for places that could have hosted and preserved life.

"The term 'life-detection' is so ill-defined and so hard to ascertain it doesn't make a good starting point," said geologist John Grotzinger, with the California Institute of Technology.

Instead, NASA's new Mars mission, scheduled for landing on August 6, is primarily a geological expedition to an intriguing piece of real estate called Gale Crater, located just south of the Martian equator.

Scientists believe the crater formed some 3.5 billion to 3.8 billion years ago when Mars, Earth and the rest of the planets in the inner solar system were regularly bombarded by meteorites.

Gale's most striking feature is not the 96-mile (154-km) wide pit in the ground, but a 3-mile-high a(5-km-high) mound of debris rising from the crater's floor. Scientists believe the mountain, located in the center of the basin, is the layered remains of sediment that once filled the crater.

Over time and by a process not well understood, the sediment was carried away, leaving what is now known as Mount S

harp, which scientists hope will reveal the geological history of Mars like no similar formation can do on Earth.

"There is no place on Earth you can go to get the whole history at once," Grotzinger told journalists during field trip last month to California's Death Valley, one of the few places where chunks of Earth's geologic record are exposed.

"At Gale you don't need to reconstruct the layers. You can see how they go from older to younger. You've got time's arrow always pointed in the right direction. It's all laid out very simply," Grotzinger said.

PRESERVATION OF LIFE

Previous missions to Mars revealed compelling evidence that the planet was once warmer and wetter than the cold dry desert it is today. For example, NASA's Mars Exploration Rovers, one of which is still operating after more than seven years on the planet's surface, found minerals that on Earth only form in the presence of water.

Liquid water is one of three key ingredients needed for life - at least life as we know it. Life's recipe also requires an energy source, such as solar or chemical, and a source of carbon.

"One of the ingredients of life is water. We're now looking to see if we can find other conditions that are necessary for life," said Mary Voytek, director of NASA's astrobiology program.

The holy grail for the Mars Science Laboratory is to find organically produced carbon, a tricky proposition because almost every process that makes rock destroys

organics.

"Even on Earth finding signs of past life isn't easy. Whatever was happening biologically, if anything, for the first 4 billion years there is no record. For the first 3 billion years, there's no rock record either," Grotzinger said.

One technique that has proven useful on Earth is to search for chemistry that can preserve life, a system scientists are adopting to hunt for signs of life on Mars as well. On early Earth for example, minerals, such as silica, are important because they preserved the record of carbon.

"You pickle the organics early on," Grotzinger said.

"Let's assume life did evolve on Mars. Where are the places that have habitable environments and the highest preservation potential?" he said. "If you do this as a random walk, you're doomed to failure because you only have so much time and the clock is ticking."

If the Mars Science Laboratory touches down safely, which is by no means a given, scientists expect to have two years to collect information about Mount Sharp and the surrounding area.

NASA hopes to land the rover on a flat surface as close as possible to the base of Mount Sharp using a first-of-a-kind, rocket-powered sky crane. The exact landing spot will depend on the craft's final steering maneuvers as it races toward Mars.

The rover blasted off aboard an unmanned Atlas 5 rocket on November 26 for a nine-month, 60-million mile voyage that is due to end just after 1 a.m EDT on August 6.

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