

# Mars breakthrough: Scientists uncover red planet's hot and steamy secrets

July 21 2009

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Molten surface on Mars. Image by Craig O'Neill

(PhysOrg.com) -- An analysis of Martian meteorites has led scientists to believe that Mars was molten for up to 100 million years after it formed, thwarting the evolution of early life on the planet.

The research, just published in the prestigious international journal *Nature Geoscience*, has shown that the red planet remained excessively hot - with temperatures in excess of 1000 degrees Celsius - for 100 million years following its formation.

The team of international scientists from the USA, Belgium, and Australia, and spearheaded by workers at NASA's Johnson Space Center, studied the radioactive clocks ticking away in a particularly rare

and ancient type of Martian meteorite called a Nakhlite (named after Nakhla in Egypt where the first one was found).

They have made the most precise measurements yet on rare isotopes of exotic elements such as Hafnium, Lutetium, and Neodymium. These isotopes allow scientists to date ancient events deep in Mars' earliest history.

"We were able to reconstruct the timescale for Mars' earliest evolution," says Macquarie University planetary scientist Dr Craig O'Neill, the only Australian scientist on the study.

Contrary to the popular belief that it only took a few thousand years for [Mars](#) to cool and solidify from an initially molten ball, their study suggests that there was a thick steam atmosphere on Mars very early in the planet's history that kept the surface a magma ocean for 100 million years - and essentially sterile the whole time.

"The conditions for life wouldn't have existed, unless you could really handle the heat," O'Neill said. "The toughest extremophile bacteria on Earth can withstand up to 130 degrees Celsius, so that makes it very difficult to see how life could have evolved under the conditions on primeval Mars.

Subsequently, the solidified magma ocean would have overturned in a lava lamp-like fashion, says O'Neill. The resulting forces and volcanism from this process may have formed the early Martian crust, and the scars of the ordeal might still be seen on surface today. Evidence for water has been found on Mars, but life may have been possible only after the steam started to rain out of the atmosphere.

The study was made possible by some of the most accurate measurements yet on radioactive isotope systems.

"Our measurements are up to 20 times more accurate than previous studies, so we've really been able to nail the timescale," he said. "The magma ocean eventually froze and overturned - which would have been probably the most violent [volcanic](#) event the planet ever saw - but we now know this took much longer than most people think it takes magma oceans to cool."

Provided by Macquarie University

Citation: Mars breakthrough: Scientists uncover red planet's hot and steamy secrets (2009, July 21) retrieved 27 April 2024 from <https://phys.org/news/2009-07-mars-breakthrough-scientists-uncover-red.html>

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