Scientists use Dorset, UK, as model to help find traces of life on Mars

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Acidic stream in Dungy Head, Lulworth Cove, on the eastern end of St Oswald's Bay, UK. Credit: Imperial College London.

Imperial College London scientists have found traces of fatty acids—key building blocks of biological cells—in Dorset's acidic streams. They say that because of the similarity of acidic streams in Dorset and on Mars, their findings hint that life might once have existed on Mars.

By applying their findings to the Red Planet, they concluded that there could be nearly 12,000 Olympic sized pools of organic matter on Mars that could represent traces of past life.

Dorset is home to highly acidic sulphur streams that host bacteria which thrive in extreme conditions. One such environment, in St Oswald's Bay, mimics the conditions on Mars billions of years ago.

Researchers treated the landscape as a template for Mars and examined the organic matter preserved in rock deposits nearby. The iron-rich mineral goethite transforms to hematite which is very common on Mars and gives the planet its red colour. If these iron-rich minerals harbour traces of life on Earth, then they may hold clues to past microbial life on the Red Planet.

Their study found that goethite in St Oswald's Bay hosted many microbes as well as traces of their fossilised organic remains.

The authors applied these results to a Martian environment: Based on how much rock is from acid environments on Mars, and assuming the concentration of fatty acids found in Martian sediments matches that of Earth, there might be up to 2.86×1010 kg of fatty acids preserved within Martin rock—equivalent to nearly 12,000 Olympic-size pools.

Previous missions to find traces of life have used heat to inspect rock for the presence of organic matter. Scientists suspect the heat might have caused minerals to react with any organic matter, explaining why we haven't yet found traces of life.

However, heating goethite or hematite does not destroy any organic matter that's there, meaning these minerals could be good life-search targets.

Co-author Professor Mark Sephton, Head of Imperial's Department of Earth Science & Engineering said: "Mars harboured water billions of years ago, meaning some form of life might have thrived there. If life existed before the water dried up, it would probably have left remains that are preserved to this day in Martian rock.

"However, we have yet to find convincing traces of organic matter that would indicate previous life on the Red Planet."

Co-author Jonathan Tan, also from the Department of Earth Science & Engineering, said: "St Oswald's Bay is a present-day microcosm of middle-aged Mars. As the acid streams dry up, like during Mars' 'drying period', they leave goethite minerals behind which preserve fatty acids that act as biological signatures."

Professor Sephton added: "Now we should let Dorset's landscape guide our life detection efforts on the Red Planet.

The authors say that if we do find traces of life, it will probably be in the form bacteria that can thrive in extreme environments—like the acid streams on Earth.

They hope to programme the next life-searching mission to Mars, Mars 2020, to search for these dried up streams and inspect the sediment for traces of fatty acids.

More information: "The Fate of Lipid Biosignatures in a Mars-Analogue Sulfur Stream" by Jonathan Tan, James M. T. Lewis and Mark A. Sephton, published 15 May 2018 in *Scientific Reports*.

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