

New Scientist

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SPECIAL REPORT

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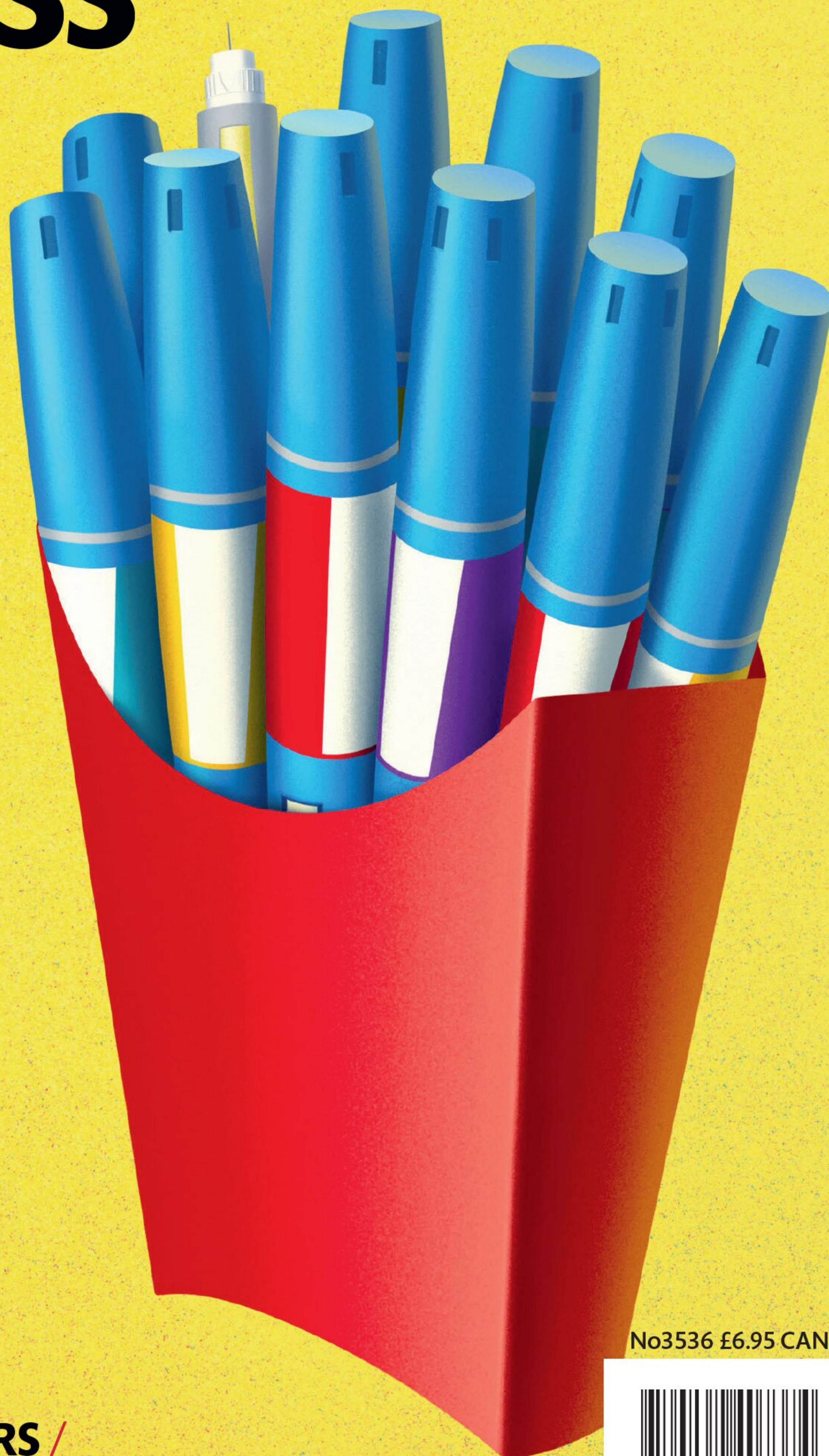
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Could this be a sign of life on Mars?

New evidence suggests that rock markings are most likely caused by ancient microbial activity

Alex Wilkins

SCIENTISTS say marks found on Martian rocks could have been caused by ancient microbes.

Last year, while exploring an ancient lakebed called Bright Angel in Mars's Jezero crater, NASA's Perseverance rover discovered a rock with unusual markings – called “leopard spots” and “poppy seeds” – similar to patterns associated with microbes on Earth. The leopard spots, which are millimetre-sized dark blotches with a circular rim, and the poppy seeds, which are smaller dark blotches, were sandwiched between white reams of calcium sulphate, a mineral that typically forms in the presence of water.

On Earth, similar marks are typically associated with the fossilised activity of microbes. That is because the chemical reactions that produce them also generate energy, and these processes, called reduction and oxidation (redox) reactions, are an essential fuel source for microbes. Such redox reactions often leave behind telltale chemical signs, such as iron and sulphur in “reduced form”, meaning they have lost electrons.

Now, Joel Hurowitz at Stony Brook University in New York state and his colleagues have used Perseverance's onboard instruments to work out the chemical composition of the spots on Mars. The poppy seeds showed iron phosphate, with reduced iron, and the leopard spots showed reduced iron, as well as iron sulphide with sulphur in a reduced form. The rock around the spots

“Leopard spot” and “poppy seed” markings point to microbe activity

also contained iron in an oxidised form, suggesting that redox reactions had indeed taken place.

There are only two ways that we know of to produce minerals with reduced sulphur on Earth, said Michael Tice at Texas A&M University, who with Hurowitz presented their work at the Lunar and Planetary Science Conference in The Woodlands, Texas, on 12 March. The first, which can happen without the presence of microbial life, happens over thousands to millions of years and typically needs temperatures

to rise above 120°C (250°F). The second, a different chemical reaction related to microbes, can take place at lower temperatures.

If the Martian rocks had been subjected to extremely high temperatures, then they should have shown relatively large crystals that would have formed from melting and resolidifying. But Hurowitz and his colleagues couldn't see evidence of this.

“The only mechanism that we know of now is biologically mediated,” said Tice. However, he added that, when the biological reaction takes place on Earth, we normally see additional chemical features, such as large crystals of dolomite, a mineral made from calcium magnesium carbonate. These features seem to be missing from the Martian sample. Thus, said Hurowitz, we will need to analyse rock samples collected by Perseverance, which are due to be returned to Earth in the 2030s.

Though the evidence still has a lot of uncertainty, the way these minerals are interacting chemically is unlike anything else we have found on Mars, says Janice Bishop at the SETI Institute. ■



NASA/JPL-CALTECH/MSSS

Health

Microdosing LSD is not an effective ADHD treatment

TAKING small, repeated doses of the psychedelic drug LSD doesn't alleviate ADHD symptoms any more than a placebo.

Microdosing psychedelic drugs involves taking them a few times a week in small enough doses to not experience hallucinations. Some research has shown that people who microdose to treat ADHD report symptoms improving, but

these studies were observational and relied on self-reported data.

To test this effect more rigorously, Matthias Liechti at the University of Basel in Switzerland and his colleagues conducted the first ever randomised controlled trial of LSD microdosing for ADHD. They recruited 53 adults from the Netherlands and Switzerland who were diagnosed with ADHD and experienced moderate to severe symptoms. Twenty-seven of the participants took a 20-microgram dose of LSD twice a week – about a fifth of a standard dose – while the

rest were given a placebo.

ADHD symptoms were assessed at the start of the study and six weeks later using a 54-point scale, where higher scores indicated more severe symptoms. On average, scores decreased by about 7 points in those taking LSD and nearly 9 points in those given a placebo, but this isn't a significant difference, says Liechti (*JAMA Psychiatry*,

“Some studies have shown that people who microdose to treat ADHD report symptoms improving”

doi.org/pcn7). However, it could be that the dosage wasn't right for treating ADHD, he says. LSD may also need to be taken daily to experience a decrease in symptoms, says Conor Murray at the University of California, Los Angeles.

“We still need to see whether an acute dose – meaning while the drug is in your body – does that have any reduction in symptoms?” says Murray. “And if it doesn't, then you almost don't even have to ask whether there is any enduring change.” ■

Grace Wade