

Life on Mars?

Our astrobiologist-in-residence, **Professor Lewis Dartnell**, discusses the possibility of finding extraterrestrial life in our solar system.

"You could possibly have jumped into a spaceship and jumped into a time machine, gone back a few billion years in Mars's history, scooped up a glass of Martian river water and drunk it – it's habitable water, it's conducive for life," says Professor Lewis Dartnell, Professor of Science Communication at the University of Westminster.

"So, if the environment on Mars was suitable, the next question that begs is: did any life evolve, emerge or originate in that environment?"

This year, the world's imagination was once again captured by space exploration, with the Perseverance Mars Rover's February landing; two new missions to Venus announced in June; Jeff Bezos's and Elon Musk's competing space aspirations (what Professor Dartnell terms the "tech bros' space race"); even US Intelligence's refusal to rule out the existence of aliens in its much-anticipated UFO report, released in June.

This imaginary spaceship-inside-a-time-machine scenario may sound like the premise of a cult 1960s sci-fi film, but Professor Dartnell is perfectly serious.

"Large areas, we think, were once basically a seabed that was covered by a sea of water," he explains, adding: "we see lots of areas that look like river deltas on Mars as well."

At the time of writing, NASA's official hunt for life on Mars – past, present, perhaps even future – has begun. And this is science, not science fiction.

"There's a very clear distinction between astrobiology and UFO spotting," he says.

Professor Dartnell is perhaps best known for his popular science writing such as *Origins* (2019) and *The Knowledge: How to Rebuild Our World After An Apocalypse* (2014), as well as TV and Radio appearances, such as *The Sky at Night*. His field of astrobiology is about understanding the origins, evolution, and limits of life on Earth and elsewhere in the universe.

Much of Professor Dartnell's research has involved searching for "hardy bacteria" on Earth's "analogue sites" – areas closely resembling conditions on other planets (or other celestial bodies like moons). His study of Mars has taken him to the Dry Valleys of Antarctica and Chile's Atacama Desert, using the same techniques that will now be used to hunt down bacteria on the real Mars.

"I'm confident that if there was life on Mars, we would be able to find evidence of it," he says.

Beyond simple stargazing (or "UFO spotting"), finding bacterial life on other planets could have practical uses back on Earth.

"You might start being able to do some really interesting biotechnology with those cells," explains Professor Dartnell. "Because in order to survive in a Martian environment, cells would have to be very hardy, very versatile. They'd have to have enzymes in them that would work in very cold, very salty conditions."

Cells of this kind could be used in washing detergents, paternity tests, or even in biofuels.

Compared to Mars, Venus – Earth's other neighbour – has often been overlooked. With a similar size, mass and gravity to Earth, its climate is something else.

"It has this horrific greenhouse effect," Professor Dartnell says. "It's hotter than an oven on the surface and has clouds of highly concentrated sulphuric acid. It's a very extreme environment. Venus is Earth's evil twin."

And then, last year, potential phosphine – a gas suggesting the presence of life – was detected in Venusian clouds. With three different missions to the planet now confirmed, it is a "very exciting" time, Professor Dartnell says. But life on Venus may be hard to find.

"The surface is hot enough to melt lead," he says. "The higher up you go, it gets cooler and cooler and



cooler, and then you eventually reach an altitude where the temperature is basically Earth temperature."

Up high in the clouds, "there's a possibility of a habitable zone of conditions – environmental conditions – that are appropriate for life."

When scientists refer to possible life on Mars or Venus, they are talking about microscopic bacteria, not little green men. But, returning to the hypothetical spaceship inside a time machine, could there once have been complex life on Mars, or even Venus? Are they a window into Earth's future?

"It's a good point," Professor Dartnell says. "But in the future, Earth could die like Mars, or it could die like Venus."

In the Venus scenario, Earth will get hotter and hotter until the oceans evaporate into steam and the planet is boiled dry. Mars is the exact opposite of this. A much smaller planet, it lost its magnetic field early on, its atmosphere was "blown away into space by solar wind" and it experienced what is called a 'runaway ice-house'. The Venus scenario is the most likely, Professor Dartnell says, at least at first.

The better we understand Venus and Mars, the better we understand both the origins of life on Earth and its future – particularly as we face the current climate crisis. But could people live on Mars one day?

"It's a mainstay of sci-fi, it's the rallying cry of Elon Musk," Professor Dartnell says. "I think what's often overlooked is just how difficult it is to live on Mars – how hard it is to make a living there. And Mars is a far less pleasant, far more inhospitable place than the South Pole."

Having said that, he acknowledges establishing a self-sustaining colony on Mars could protect the human race from extinction, if, for instance, a huge asteroid hit the planet.

"I think we should be focusing on solving climate change and other problems, here on Earth," he cautions though. "Because Mars is not – it is *not* – a get-out-of-jail-free card."