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Solar system

Potential sign of Venus life supported by old NASA data

Leah Crane

WE HAVE another hint that there really is phosphine – a gas that may be a sign of life – in the clouds of Venus, and it comes from old data collected by a spacecraft that visited the planet in 1978.

Last month, Jane Greaves at Cardiff University in the UK and her colleagues announced that they had found phosphine in the Venusian atmosphere after using two telescopes to spot it absorbing light that bounced through the clouds of Venus. They couldn't link that phosphine to any known chemical processes of the planet, leading them to suggest the possibility that it came from living organisms.

"There was some controversy in terms of the veracity of the signal, and I was inspired from that to look for other evidence that could support that detection," says Rakesh Mogul at California State Polytechnic University, Pomona. He and his colleagues re-examined data from NASA's Pioneer Venus Multiprobe, which measured the masses of various compounds as it sank into the crushing Venusian atmosphere in 1978.

Mogul and his colleagues found previously unreported signs of phosphine consistent with the levels that Greaves's team spotted from Earth, along with other chemical compounds that are expected to form as phosphine breaks down (arxiv.org/abs/2009.12758).

Data like this, from a mass spectrometer, is notoriously difficult to interpret, so this finding isn't completely definitive, says David Grinspoon at the Planetary Science Institute in Arizona. "I'm still not 100 per cent ready to declare there's definitely phosphine in the clouds of Venus, but it's more strongly indicated now than it was before there was this second hint."

NASA/PAUL HUDSON

An illustration of the Pioneer Venus Multiprobe

Mogul's team also reported signs of several other molecules, such as methane and nitric oxide, that we didn't expect to be present in Venus's clouds. That isn't necessarily surprising, says Grinspoon. "If phosphine is there, then there's some chemistry that we didn't know about going on there." That wouldn't just mean the addition of phosphine to our current models. "There would be other things too," he says.

"If phosphine is there, then there's some chemistry that we didn't know about going on"

Methane in particular is interesting because it has long been considered a potential biosignature, although there are other ways to make it. "If there is life in Venus's clouds – which is, of course, extremely speculative at the moment – we would expect a ton of biosignatures, not just phosphine," says Clara Sousa-Silva at the Harvard-Smithsonian Center for Astrophysics in Massachusetts, who worked with Greaves on the phosphine discovery.

We still have a long way to go before we understand Venus enough to figure out where phosphine and these other unexpected compounds come from, she says. Combing through old data with new eyes is a start, but eventually we will need more space missions to really understand what is going on.

"It's amazing that here we are, trying to glean every bit of meaning out of data that is from a spacecraft that was launched in 1978, when we know how to build instruments that would absolutely nail this answer if we sent them to Venus today," says Grinspoon. "If anything, it's a testament to how unexplored Venus is." ▮

Animal behaviour

First cockroach species seen to have workers and a queen

Michael Marshall

COCKROACHES can team up. A South American species is the first cockroach known to live in group nests with workers and a queen, like honeybees or leafcutter ants.

"All cockroaches are solitary," says Peter Vršanský at the Slovak Academy of Sciences in Bratislava – or so everyone thought. Some animals, such as honeybees, are eusocial: not only do they live in large groups and work together to tend to the young, but most individuals don't reproduce.

Vršanský and his colleagues spent 20 years looking for living specimens of the cockroach *Melyroidea magnifica*, which has barely been seen since it was identified in cloud forests around the Rio Bigal nature reserve in Ecuador in 1912. Local conservationist Thierry Garcia at the Sumac Muyu Foundation in Ecuador finally found a nest in 2017.

The cockroaches nested in bamboo or hardwood trees in groups of several hundred. They spend a lot of time inside the nests, which explains why they were so hard to find. "There was one week where not one cockroach was outside," says Vršanský.

The adult cockroaches had bright red heads and green abdomens. There were also tiny black larvae.

The team found one individual 1.25 times larger than the others with white wings. This was tentatively identified as the queen, but Vršanský says more evidence is needed to be sure (*The Science of Nature*, doi.org/fb47). "We would need to prove that it is the only individual which lays eggs," he says. Yet in two months of observations, they never saw the other cockroaches laying eggs, which suggests they are sterile workers.

The finding highlights how little is known about cockroach behaviour, says Vršanský. "We know nearly nothing." ▮