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Palaeontology

# Tiny structures in rock might be earliest known fossils of life on our planet

Carissa Wong

SMALL structures found in a rock that formed near a hydrothermal vent at least 3.75 billion years ago may represent the fossil remains of the earliest known life on Earth – but the findings are controversial.

Exactly when and how life emerged on Earth is widely debated. All we know is that it occurred sometime after Earth formed 4.5 billion years ago and before the earliest confirmed microbial fossils appeared around 3.4 billion years ago.

In 2017, Dominic Papineau at University College London and his colleagues analysed rocks collected from the coast of northern Quebec, Canada, in an area known as the Nuvvuagittuq Greenstone belt. By imaging sections of rock, the team found tiny tubes and filaments made of iron oxide, or rust, that resembled structures formed by bacteria that live in deep-sea hydrothermal vents today.

Now, the researchers have analysed a fist-sized rock from the same site by slicing it into pieces that are more than twice as thick

as before – about 100 micrometres wide. This allowed them to get a bigger picture of the structures within the samples, which revealed a centimetre-long pattern of corkscrew-shaped iron filaments, arranged as a stem with parallel branches.

“The largest fossil in the rock is nearly a centimetre long and is organised in a structure that is tree-like. It’s very beautiful

**Filaments in this rock might be the earliest signs of life on Earth**



D. PAPINEAU

because the structures are red in colour,” says Papineau. “And those branching filaments are twisted like corkscrews, which has been thought of as a sign of life because [non-biological] processes are not known to make them.”

The tree-like pattern is surrounded by bubble-like ellipsoids that the researchers suggest could also be a result of microbial activity. But as these ellipsoids are known to sometimes result from certain types of non-biological chemical reaction, they call them dubiofossils

(*Science Advances*, doi.org/hqcj).

“The paper provides one of the most comprehensive analyses I’ve seen of [supposed] microfossils in 3.75-billion-year-old rock,” says David Emerson at the Bigelow Laboratory for Ocean Sciences in Maine.

But further work is needed to establish whether non-biological reactions could have produced the structures, says Emerson.

Others think a non-biological origin is more likely. They point out that the ancient rocks were buried deep in Earth’s crust for some time, where they were baked at temperatures of over 500°C and exposed to pressures that might have created the filamentous structures through non-organic processes.

“I think that this is a very sound study, although I do not agree that the filamentous structures or the ellipsoids are fossil bacteria,” says Frances Westall at the Centre for Molecular Biophysics in Orleans, France. But Westall doesn’t rule out that life may have once lived in the ancient environment represented by the rock. ■

Archaeology

## 19th-century dairy farming women didn’t breastfeed

WOMEN from a 19th-century farming community in the Netherlands probably didn’t breastfeed their babies because they were too busy working. It is the first time that widespread alternative feeding has been discovered in a farming community from this period.

Andrea Waters-Rist at Western University in Canada and her colleagues analysed the bones

of about 500 individuals who died between 1830 and 1867 in Middenbeemster, a rural village in the north of the Netherlands. The remains were dug up because a church was expanding into the cemetery, and Waters-Rist and her team were offered the chance to analyse them. They also had death certificates for about half the people.

The researchers wanted to find out more about the diets of the women and children in this village, which mainly consisted of dairy farmers at this time. They were able to determine whether the children were breastfed by analysing the

chemical isotopes in their bones.

Out of 20 children who had died before the age of 1, 15 showed no evidence of breastfeeding. And out of 35 children aged between 1 and 6, 29 showed no signs of breastfeeding in their bones (*PLoS One*, doi.org/hqbv).

The team believes this was probably due to the fact that women predominantly worked the farms in this community, milking

**“We think it’s a sign of how hard the women were working and that they were just really busy”**

and raising the cows. “We think it’s a sign of how hard the women were working and that they were just really busy,” says Waters-Rist. “Also, there was always fresh cow’s milk.”

This behaviour has only been seen in this period before in large cities where women were working in factories and couldn’t take their babies with them, she adds.

“The findings of this study are intriguing for an agricultural community where mothers and infants would not have spent long periods apart,” says Ellen Kendall at Durham University in the UK. ■ Jason Arunn Murugesu