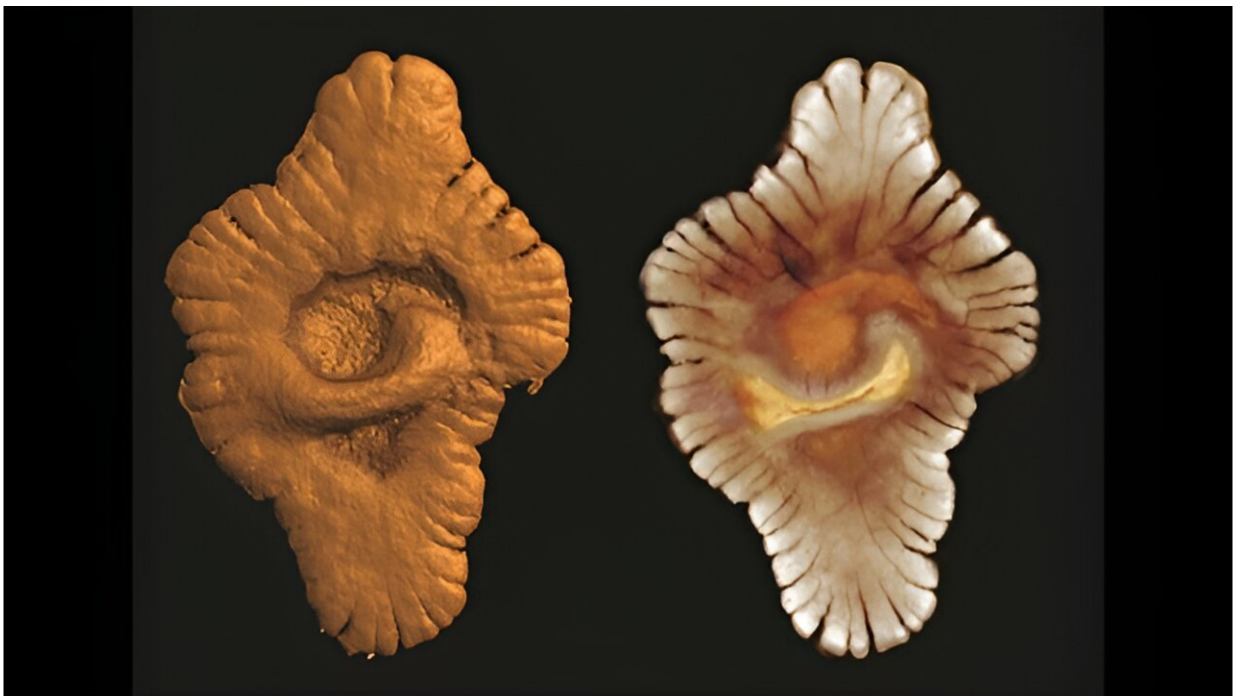
PHYS.ORG

Complex life on Earth began around 1.5 billion years earlier than previously thought, new study claims

July 29 2024



The team's research provides strong validation for the biological affinity of the lobate macrofossils whose validity has been widely debated in the scientific community. Credit: Professor Abderrazzak El Albani of the University of Poitiers, France

Environmental evidence of the very first experiments in the evolution of complex life on Earth, has been uncovered by an international team of scientists.

Until now, scientists broadly accepted animals first emerged on Earth 635 million years ago.

But a team, led by Cardiff University, has discovered evidence of a much earlier ecosystem in the Franceville Basin near Gabon on the Atlantic coast of Central Africa over 1.5 billion years earlier.

Their study, presented in *Precambrian Research*, describes an episode of unique underwater volcanic activity following the collision of two continents, which created a nutrient-rich 'laboratory' for the earliest experiments in complex biological evolution. The paper is titled "Hydrothermal seawater eutrophication triggered local macrobiological experimentation in the 2100 Ma Paleoproterozoic Francevillian sub-basin."

Dr. Ernest Chi Fru, the paper's lead author and Reader at Cardiff University's School of Earth and Environmental Sciences, said, "The availability of phosphorus in the environment is thought to be a key component in the evolution of life on Earth, especially in the transition from simple single cell organisms to complex organisms like animals and plants.

"We already know that increases in marine phosphorus and seawater oxygen concentrations are linked to an episode of biological evolution around 635 million years ago. Our study adds another, much earlier episode into the record, 2.1 billion years ago."

Scientists have widely debated the validity of large-sized fossils of macroorganisms from this period, which are the earliest of their kind in the geologic record.

But the Cardiff-led team identified a link between environmental change and nutrient enrichment prior to their emergence which might have triggered their evolution.

The team's geochemical analysis of the marine sedimentary rocks deposited 2.1 billion years ago sheds new light on this much-disputed body of unusually large-sized fossils in the Francevillian basin.

Dr. Chi Fru added, "We think that the underwater volcanoes, which followed the collision and suturing of the Congo and São Francisco cratons into one main body, further restricted and even cut off this section of water from the global ocean to create a nutrient-rich shallow marine inland sea.

"This created a localized environment where cyanobacterial photosynthesis was abundant for an extended period of time, leading to the oxygenation of local seawater and the generation of a large food resource.

"This would have provided sufficient energy to promote an increase in body size and greater complex behavior observed in primitive simple animal-like life forms such as those found in the fossils from this period."

However, the restricted nature of this water mass, together with the hostile conditions that existed beyond the bounds of this environment for billions of years later, likely prevented these enigmatic life forms from taking a global foothold, the researchers say.

Their study suggests that these observations may point to a two-step evolution of complex life on Earth.

Step one followed the first major rise in atmospheric oxygen content 2.1

billion years ago and step two followed a second rise in atmospheric oxygen levels some 1.5 billion years later.

"While the first attempt failed to spread, the second went on to create the animal biodiversity we see on Earth today," he says.

The team is working on putting better constraints on the environmental conditions that explain the appearance of these enigmatic fossils.

More information: Ernest Chi Fru et al, Hydrothermal seawater eutrophication triggered local macrobiological experimentation in the 2100 Ma Paleoproterozoic Francevillian sub-basin, *Precambrian Research* (2024). DOI: 10.1016/j.precamres.2024.107453

Provided by Cardiff University

Citation: Complex life on Earth began around 1.5 billion years earlier than previously thought, new study claims (2024, July 29) retrieved 29 July 2024 from https://phys.org/news/2024-07-complex-life-earth-began-billion.html