PRESS RELEASE

Grenoble, 1st July 2020

An international team led by a scientist from the ISTerre laboratory (UGA-CNRS-USMB-IRD-Université Gustave Eiffel) studied the first animal fossil contained in a gem opal from Indonesia. Published in Scientific Reports on June 29, 2020, this publication reveals that these opals may contain very well preserved fossils, a larva of the cicada family in this first case. This discovery provides a new avenue to explore the evolution of life on Earth or the possible emergence of life on Mars, and proves that the song of the cicadas was already resonating in Indonesia several million years ago.

Fossil archives make it possible to trace the evolution of life on Earth through the various materials in which they are preserved. Sediments deposited in lakes or oceans, or amber (the ancient resin of the fossilized tree) have preserved traces of organisms over much of the Earth's history. Among these materials, the oldest traces of life on Earth today are cherts, siliceous rocks formed several billion years ago. The silica (or silicon dioxide, SiO2) that constitutes them is indeed very resistant to the ravages of time.

Among the minerals made up exclusively of silica, there is a variety that is highly appreciated for its beauty and impressive light effects: opal. Used in jewelry, opal is best known in Australia and Ethiopia, who together supply large quantities of it. This type of silica has also been identified on Mars, making it one of the major targets for exploring the possibility of life on the red planet. Indeed, in Australia, wood and even dinosaur bones are totally opalized, giving a psychedelic aspect to these fossils. In Ethiopia, plant fossils are contained in opal stones, but no animal fossils have ever been found.

In the study "Arthropod entombment in weathering-formed opal: new horizons for recording life in rocks", published in Scientific Report, scientists studied the first animal fossil contained in a gem opal.

Thanks to X-ray tomography, a kind of high-resolution scanner, it was possible to reconstruct the shape of the fossil in its entirety. The 6 pastes and its body divided into head, thorax and abdomen make it possible to say that it is an insect. The shape of its front pasta and its mouth parts are characteristic of the larvae of the super-family Cicadoidae, of which the best known representatives are the cicadas. The larvae of these insects live in the soil, sometimes for several years (up to 17), so fossils of these larvae are rare.

Silica is already known to be a fossil preservative, but in most cases it comes from hydrothermal sources (such as geysers) that are usually very localized on the Earth's surface. Opal can also be formed by rock weathering, which is the deterioration by water of the minerals making up the rocks, releasing the silica that makes up these minerals. The fluids thus enriched with silica will fill cavities in the rock and form the gem opal. In the sample studied, this cavity contained a larva, or larval moult, which allowed this fossil to be preserved over several million years. This study shows that silica resulting from the weathering of rocks by climate, a process much more widespread on the surfaces of planets than hydrothermal springs, is also a source of paleontological records. The identification of this type of silica on Mars also makes it a very interesting material to study the possibility of life on this planet. This broadens the possibilities of finding traces of life both on Earth and on Mars, where this type of silica is known and identified.

In addition to the intrinsic beauty of this sample, it provides a new way to understand the evolution of life on Earth or the possible emergence of life on Mars, or simply to imagine that the song of the cicadas was already resounding in Indonesia several million years ago.

Caption: Photograph of the fossil cicada larva included in the opal.

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Link to the publication : www.nature.com/articles/s41598-020-67412-9

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