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Solving Earth’s mysteries: the great sedimentary iron deposits could have originated from the plankton of the early oceans

Kabuno bay, located in the north of Lake Kivu, in the heart of Africa (Democratic Republic of the Congo) offers a glimpse into the early oceans, showing how a tiny group of microbes developed the biggest iron deposits on Earth. Nearly one third of the microbes present in this freshwater basin grow by performing a different kind of photosynthesis by iron oxidation. It is believed that this kind of photosynthesis was the predominant on the early Earth over billions of years.

Kabuno Bay (Democratic Republic of the Congo).

A recent study involving researchers from the UAB has recently been published in the international journal *Nature Scientific Reports*, showing that nearly one third of the microbes present in Kabuno bay, an isolated freshwater iron-rich basin of Lake Kivu (Democratic Republic of the Congo, East Africa), grow by performing a different kind of photosynthesis by iron oxidation instead of the conventional conversion of water into oxygen as plants and algae do.

A multidisciplinary team of scientists have discovered that the volcanic activity of the Lake Kivu region favours the iron-rich conditions present in Kabuno bay. "Kabuno bay offers the researchers an incomparable glimpse back to early Earth ocean physico-chemistry, which was primordially based on iron chemistry", says Marc Llirós, a postdoctoral researcher at the UAB. At the same time, Sean Crowe, a Canadian researcher and senior author of the work, comments on the fact that "Kabuno bay is now giving us insights into how old photosynthesis varieties may have supported early life on Earth prior to the evolution of the oxygen-producing photosynthesis that supports life on Earth today".

2.3 billion years ago there was little oxygen in the atmosphere but plenty of dissolved iron in the oceans. In such environmental conditions, many microorganisms oxidize iron by using light to obtain the necessary reducing power for growing through a photosynthetic process without oxygen, which has some similarities to the photosynthetic process carried out by algae and plants. These microbes metabolizing iron may have converted plentiful dissolved oceanic iron into minerals, which were then deposited in marine sediments worldwide. The microbes described in the present work (of the genera *Chlorobium*) metabolize iron and grow at rates high enough to credit their ancient counterparts as capable of depositing some of the world's largest sedimentary iron ore deposits (or Banded Iron Formations, BIF). Furthermore, the isolated species in Kabuno bay is highly similar to the only cultured representative to date able to perform photoferrotrophy (*Chlorobium ferrooxidans*). Through this peculiar metabolism, these microbes may have helped to shape the chemistry of the Earth over billions of years.

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References

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