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## New research finds Boring Billion did promote evolution of life

What has historically been referred to as the “Dullest Time on Earth” was in fact the birthplace of the first complex cell in evolution, at a time of nutrient crisis, new research has found.

The middle years of Earth’s history – dating 1.8 billion to 800 million years ago – is regarded as the Boring Billion due to the lack of biological evolution that occurred over the period.

During this time there was very little oxygen in the atmosphere and in the oceans to support life, with only bacteria able to survive.

New research, led by PhD student Indrani Mukherjee from the University of Tasmania’s [Centre for Ore Deposits and Earth Sciences \(CODES\)](#), has found the Boring Billion, which has fossil evidence of the very first complex cell, was a period of very low bio-essential nutrient elements.

“We know bacteria, a very simple cell, was present both before and during the Boring Billion,” Indrani said.

“What we also know is bacteria, under stress, will mutate in order to adapt and evolve to survive.

“It’s like most species: under stress, they work harder to survive and adapt, whereas no stress leads to a comfortable easy lifestyle.

“My research suggests that high stress promoted a major evolutionary change during the Boring Billion.”

University of Tasmania researchers proposed that the nutrient crisis experienced during the Boring Billion triggered endosymbiosis (symbiotic relationship) – where single cells are ingested by another ultimately leading to complex cells.

“In finding that a nutrient crisis, coincided with the fossil evidence of a complex cell, has demonstrated that the Boring Billion, although a nutrient-poor period, did in fact promote the evolution of life,” Indrani said.

With bacteria able to survive with very little oxygen, it was the lack of trace element nutrients such as selenium, nickel, and molybdenum – essential for life – that created the urgent need for adaptation.

As these trace elements, and oxygen levels, rose following the Boring Billion, life had made the jump to complex cells and was primed for evolution.

Rather than the “Dullest Time” on Earth, Indrani describes the Boring Billion as the slingshot to complex life on earth, and the necessary precursor for the Cambrian explosion seen in the fossil record a few hundred million years later.

“There’s always been a lot of focus on macro evolution and the Cambrian explosion (541 million years ago),” Indrani said.

“Yet, evolution really starts with the transformation of simple cells into complex ones, and it is in the Boring Billion that scientists have previously found the first fossilised evidence of a complex cell.

“Historically, most research emphasises oxygen in the atmosphere and in the oceans as a driver of the evolution of life.”

Indrani said several experimental studies had proven oxygen was not necessarily required by primitive organisms.

“I started to doubt the whole trend of just relating oxygen to biological evolution,” she said.

“We used a new technique we developed to look at rocks formed in the Boring Billion. We didn’t solely focus on oxygen because there are several other nutrient elements important to sustain life.”

The University of Tasmania team used laser analysis of sedimentary pyrite in black shale samples collected from all over the world, allowing them to look at other elements essential for life including selenium, nickel, and copper, cobalt, molybdenum, zinc and cadmium.

The research, [\*The Boring Billion, a slingshot to complex life on Earth\*](#), was published in Scientific Reports, an online open access scientific mega-journal published by the Nature Publishing Group.

**Media assets:**

Media can access footage, including an interview with Indrani Mukherjee, via <https://cloudstor.aarnet.edu.au/plus/s/o0mMbE35uOTyEbl>

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