

# Lesson 10: The First Life

Close your eyes and imagine Earth about 3.5 billion years ago. The sky is a thick haze of volcanic gases. The oceans are warm and full of dissolved minerals. There are no plants, no animals, no forests, no sound except the slap of waves against bare volcanic rock. And yet, in the water, deep near hydrothermal vents and in shallow sunlit pools along the rocky shores, something extraordinary is already happening. The first living things are quietly getting on with life.

These first organisms were incredibly simple. Each one was a single cell, a tiny bag of chemistry with no complex parts inside. Scientists call them **prokaryotes**, meaning cells without a nucleus, and there are two main groups. **Bacteria** are still everywhere today: in the soil beneath every garden, in your gut right now, on your skin, in the deepest ocean trenches. **Archaea** are perhaps even more remarkable. They thrive in conditions that would destroy almost anything else, including boiling hot springs, the Dead Sea, and scalding vents on the ocean floor. Both are invisible to the naked eye. Both are **microbes**, living things too small to see. And both were here first, for billions of years before anything else.

We know these ancient microbes really existed because they left physical evidence behind. In Western Australia, scientists have found **stromatolites**, layered dome-shaped mounds built up by ancient bacterial communities, one thin film of microbes at a time, over thousands of years. The oldest stromatolite **fossils** are more than 3.5 billion years old, making them among the oldest signs of life ever discovered on Earth. What makes this truly astonishing is that living stromatolites can still be found today in a few salty, shallow bays in Australia, growing at the same patient pace as their ancient ancestors, looking almost exactly the same as they did when the first fish were still hundreds of millions of years away.

Here is something worth really thinking about: for more than two billion years, bacteria and archaea were the only life on Earth. If you squeezed all of life's history into a single calendar year, these microscopic pioneers would appear in mid-March, and complex animals would not show up until mid-November. Bacteria are not the humble beginning of life's story. They *are* the story, for most of it. And they did not just survive. They slowly, steadily changed the planet, reshaping the chemistry of the oceans and laying the foundations for everything that would one day follow.