Ancient Tiri Part1: Adventures in “Deep Time”.

The Cyanobacteria - The Atmosphere changers

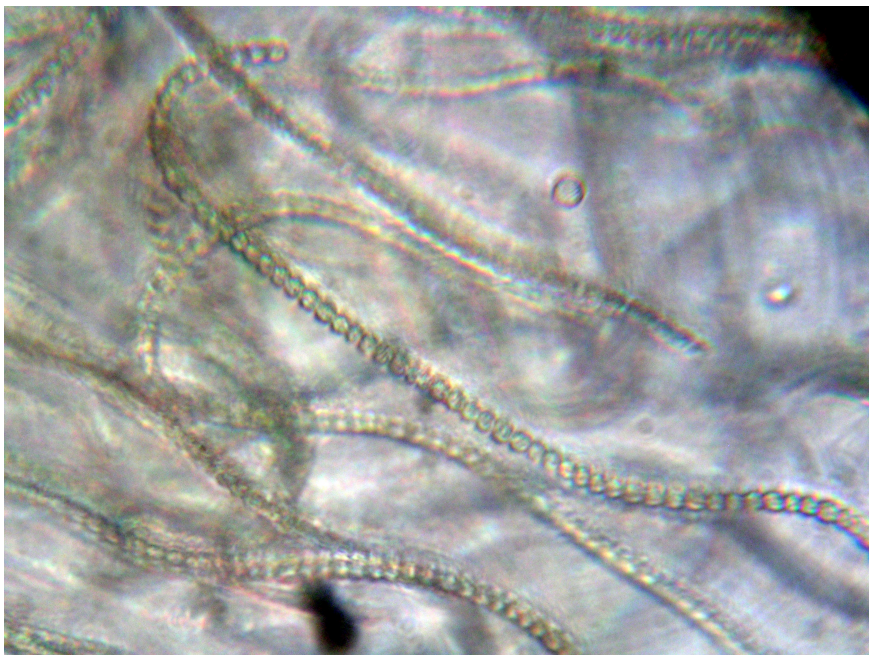
This is the first of a series of articles on the ancient plants and animals found today on Tiri that are the survivors of “Deep Time” travel – “living fossils” who have survived virtually unchanged through unimaginable aeons that are measured on a geological time scale. You might find some of this information useful if you run out of conversation while waiting for the group ahead to move on!
Some of these survivors you will see on Tiri date from the time when life first appeared on Earth some 4,000,000,000 years ago – four “gigayears” ago (4Ga).
We will be looking at Cyanobacteria, algae, liverworts and their allies, mosses, ferns and finally our mighty forest trees. We will see how they solved the problems of desiccation and reproduction when they emerged from the seas to invade the dry land. We will be including some of our “living fossil” animals too in our series.

So lets start with the *Cyanobacteria* – photosynthetic “*blue-green” bacteria* (Often mistakenly called blue/green *algae*).
Science divides life on Earth into *two broad groups* –

- The *Bacteria* (*Prokaryotes* - who allow their DNA to float around freely inside their cells).
- *Everything else* (*Eukaryotes* - including us - which store their DNA neatly packaged into a nucleus).

It is thought the Cyanobacteria evolved about 2.8Ga, and can be found in just about any wet place where they form a dark blue/green stain on the surface of wet mud.

John Sibley



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Look out for these blue/green smudges next to the track on mud and in puddles. These ones above were in a ditch at the edge of the Ridge Track.
Under a microscope they appear as rows of cells in long slime-covered filaments, and are much smaller than normal algae (which are Eukaryotes).

The Cyanobacteria are *extremely important* for the following reasons:

1. The atmosphere of Earth had no oxygen in it until these blue/green bacteria started to pump it out as a by-product of photosynthesis about 2.8Ga. Without this intervention there would be no oxygen in the air to breathe.

2. On the surface of damp soil many fix atmospheric nitrogen making nitrate plant food helping farmers today to grow crops.
3. They make sugars by photosynthesis, supporting many food chains and they often form mutualistic (symbiotic) partnerships with fungi to form Lichens.
4. Most amazingly perhaps is that about 1Ga certain species of cyanobacteria were incorporated into the cells of the first plants as *chloroplasts,* where they continue to live today. We know this because chloroplasts in modern plants still have their own bacterial DNA from all those years ago.

John Sibley

These “lump” structures in the photograph above are living stromatolytes in Shark Bay Western Australia. They are made from layers of mud and blue/green bacterial “mats” and were very extensive when the early Earth’s atmosphere was being oxygenated about 2.7Ga.
So we really do have a lot to thank these shy, inconspicuous heroes for as we tramp up the tracks on Tiri breathing in the fresh air, energised by our cereal breakfast. Indeed we humans wouldn’t be here at all without their clever photosynthetic chemistry tricks all those years ago!

Where to look for Cyanobacteria on Tiri: Dark blue/green “films” and smudges. Eg: on the margins of the Wharf Dam and under the Kokopu pool bridge, any bare damp earth banks next to the track, the slippery dark layer covering on track boards or concrete paths, the slimy layer on the wooden bannister tops around the bird baths, any puddles or damp ditches. I should add that as the summer progresses and some of the damp places dry up, so the visible traces of Cyanobacteria become harder to find. They wait out the dry conditions as highly resistant spores.

In the next article: Algae and Mosses – Emergence onto land, some unlikely links and some strange lifestyles!