Geology Matters

January 2018

Editorial

Welcome to the New Year and to a new era for **Geology Matters.** The Leader has gone, in a manner of speaking, and so to fill the void you will be treated instead to the incoherent ramblings of the editorial staff, including no doubt, the office cat. Ours is extremely well disciplined of course, but the impact of kitty paws on a computer key board can be quite disruptive, particularly as it is usually accompanied by the insertion of the kitty tail in the editorial nostril; but I digress.

You may have noticed that from time to time **Geology Matters** follows a thematic approach and this edition is in that mould – we are reporting about very ancient rocks and the origins of life. There is the edifying spectacle of academics asserting that their ancient rocks are the most ancient with traces of life. In the true traditions of journalism we report both and leave you, dear reader, to decide between their merits.

One of the great things about our winter

Is that it is summer in the southern hemisphere. Quite a good number of members have escaped our climatic rigours to visit Australia and New Zealand. Now Australia can be energy sappingly hot whilst New Zealand tends to be a warmer version of our own summers. But this isn't a travelogue, but they are both places that are well worth visiting in quite wildly contrasting ways. Geologically they are very different with Australia's ancient cratons contrasting with the 'Johnny-come–lately' volcanoes of its southern neighbour.

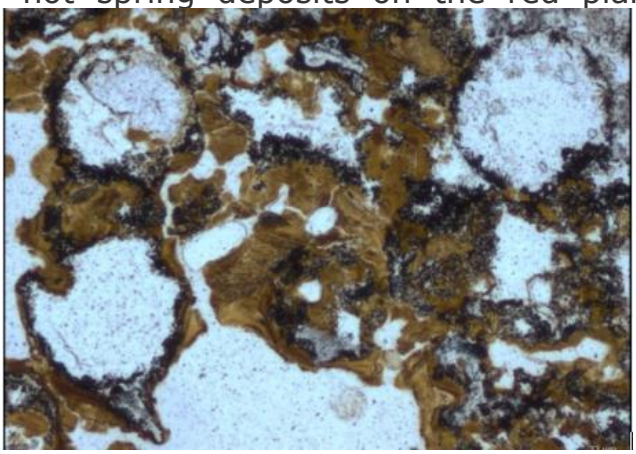
A joint Australian/New Zealand research team have been studying some exceptionally well-preserved deposits which are approximately 3.5 billion years old in the Dresser Formation of the Pilbara Craton of Western Australia. They inferred that the deposits were formed on land, not in the ocean, by identifying the presence of geyserite – a mineral deposit formed from near boiling-temperature, silica-rich, fluids that is only found in a terrestrial hot spring environment. Previously, the oldest known geyserite had been identified from rocks about 400 million years old.

Modern day geyserite being laid down in Rotorue NZ

Within the Pilbara hotspring deposits, the researchers also discovered stromatolites – layered rock structures created by communities of ancient microbes. And there were other signs of early life in the deposits as well, including fossilised micro-stromatolites, microbial palisade texture and well preserved bubbles that are inferred to have been trapped in a sticky substance (microbial) to preserve the bubble shape.

"This shows a diverse variety of life existed in fresh water, on land, very early in Earth's history," says Professor Van Kranendonk, Director of the Australian Centre for Astrobiology and head of the UNSW school of Biological, Earth and Environmental Sciences.

The Pilbara deposits are the same age as much of the crust of Mars, which makes hot spring deposits on the red planet an exciting



Spherical bubbles preserved in 3.48 billion-year-old rocks in the Dresser Formation in the Pilbara Craton in Western Australia provide evidence for early life having lived in ancient hot springs on land.

target for our quest to find fossilised life there"

Previously, the world's oldest evidence for microbial life on land came from 2.7- 2.9 billion-year-old deposits in South Africa containing organic matter-rich ancient soils.

Thess findings don't just extend back the record of life living in hot springs by 3 billion years, they indicate that life was inhabiting the land much earlier than previously thought, by up to about 580 million years.

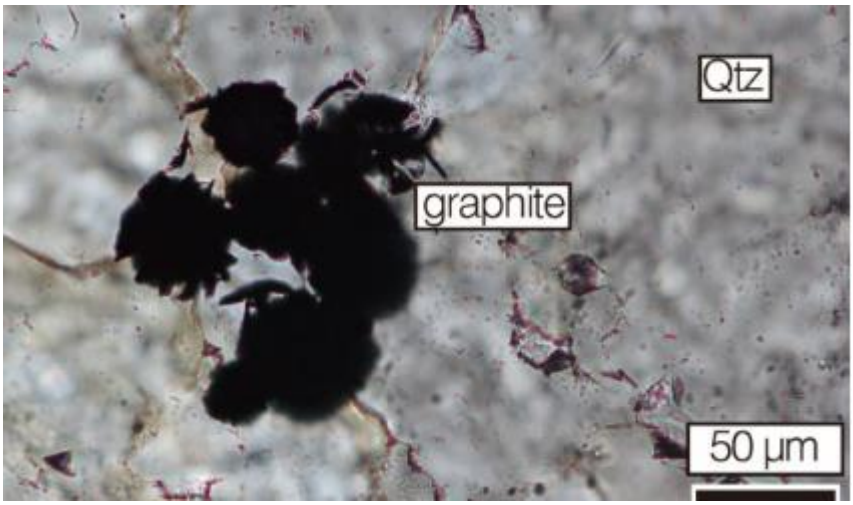
Anything you can do, I can do better !

Rocks from northern Labrador have been found to contain the oldest known evidence of life on Earth. Said another announcement.

Graphite — a form of pure carbon — found in the 3.95-billion-year-old rocks shows the geochemical signature of having come from the decomposition of living organisms. That's at least 150 million years older than the oldest graphite from living organisms previously found in 3.7 billion to 3.8 billion-year-old rocks in **Greenland** and **northern Quebec**. It's also not much more than 500 million years after the Earth formed, about 4.5 billion years ago.

Some of the signatures in the Labrador rocks suggests that the organisms that left them were autotrophic — that is, they could produce their own food from chemicals in their environment, as algae and some kinds of bacteria do .

The scientists who claim the discovery examined the ratio of carbon 12 to carbon 13 to establish the origin of the graphite. It is not clear what environmental conditions prevailed at the time, but it is fairly certainly a watery one.



What makes the Labrador rocks particularly special is that they are the oldest known metasedimentary rocks in the world. That is, they were originally formed from sediments deposited by water — the type of environment that decaying organic remains often end up in. The "meta" part of the word indicates that the rocks have been "metamorphosed" or transformed by heat and pressure over time:

Researchers have been increasingly interested in the rocks of the Uivak Gneiss in the Saglek Block of northern Labrador in recent years because they contain some of the oldest rocks on the surface of the Earth.

Such old rocks are very rare because the Earth's crust is constantly being recycled back into the planet's interior by plate tectonic action. The Labrador rocks are thought likely to be a small patch that remains from a very ancient continent,

And to continue the theme of very ancient rocks

Northeast Greenland National Park (Greenlandic: Kalaallit Nunaanni nuna eqqissisimatitaq, (please don't ask about the pronunciation) Danish: Grønlands National Park) is the world's largest and most northerly national park. It is remarkably big – even greater in area than France! It is home to 1,900m-high, stripy cliffs in Segelsällskarpet Fjord. The colourful layers are part of the Eleonore Bay group and are made up of alternating layers of limestone, dolomite, mud stones and Quartzites dated at neo proterozoic age (542 >1000 MYA).

One of the virtues of geologising in this area is that if you can find a non-snow-covered rock exposure then it is also likely to be free of vegetation, which can be something of a problem hereabouts.

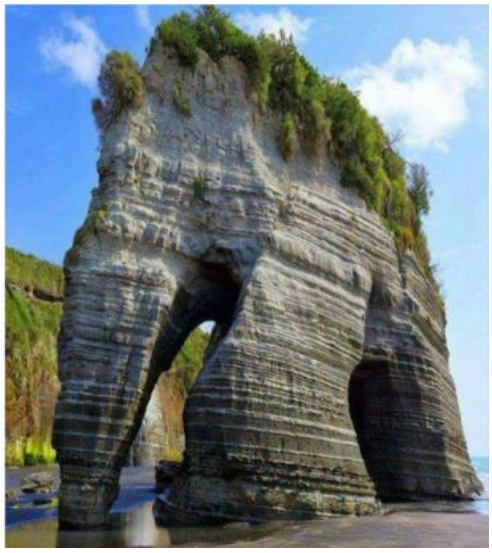
Moving on – a little puzzle (well a fairly big one really)

This being the U3A we don't have examinations – but here is a little editorial indulgence. Have a look at the satellite image that follows. The ancient structure that is pictured is about 25 km across. But what is it? And where is it? Answers to the editor by email please.

Rock of the month

This month's rock was chosen because of its rather striking colour. It is called Uvarovite and was Named after Count Sergey Semeonovich Uvarov (1786-1855), Russian statesman and scholar, President of the Academy of St Petersburg (1818-1855). Its chemical formula is $Ca_3Cr_2(SiO_4)_3$

And since we have switched to a green theme, how about an elephant rock?



This rather curious and aptly named rock can be found at Three Sisters Beach, Taranaki NZ, or rather it was found there. Sadly, the greywacke formation succumbed to the inevitable erosive effects of the Pacific Ocean and partially collapsed. This is also a fate likely to be shared by these equally transitory formations, pictured below, which are found on the beautiful Côte d'Albâtre near Étretat in Normandy.

Holiday plans

Having earlier declaimed that this was not a travelogue, I've had second thoughts, well why not! I know that many of you are well travelled and will have visited some great geology on the way. New

Zealand is a personal favourite, despite the 27 hour flight to get there. However, I looked around for some other recommendations and found these from the well regarded publishers of the **Rough Guides**. There is something there to suit all tastes. January is often a holiday planning time and we would be delighted to hear about your travels as well as sharing some of your photographs for the Group Photographic Resource.

https://www.roughguides.com/gallery/20-geological-wonders-of-the-world/

Richard Newton

Is the person we have to thank for putting all our varied and various activities on our website. He has now archived **Geology matters 2017** there as well. So once more – thank you Richard.

Feedback

Congratulations – you have read to the end of the editorial material. The editor would be pleased to hear of your reaction to the changes, and on any other issues you would care to raise.