BERWICK'S CARBONIFEROUS PAST

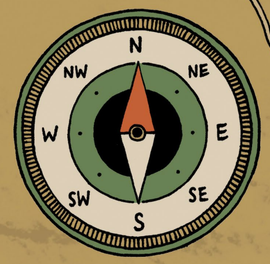
ERA	AGE (MILLIONS OF YEARS BEFORE PRESENT)	PERIOD
CENOZOIC	2·6	QUATERNARY NEOGENE
	23	PALAEOGENE
MESOZOIC	65	CRETACEOUS
	145	JURASSIC
	199	TRIASSIC
UPPER PALAEOZOIC	251	PERMIAN
	299	CARBONIFEROUS
	359	DEVONIAN
LOWER PALAEOZOIC	416	SILURIAN
	443	ORDOVICIAN
	488	CAMBRIAN
	542	PRECAMBRIAN

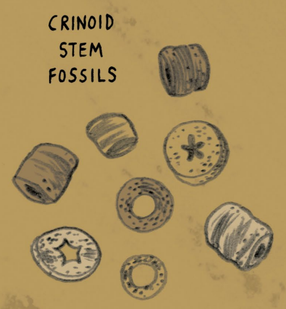
40 cm FOSSIL RULER

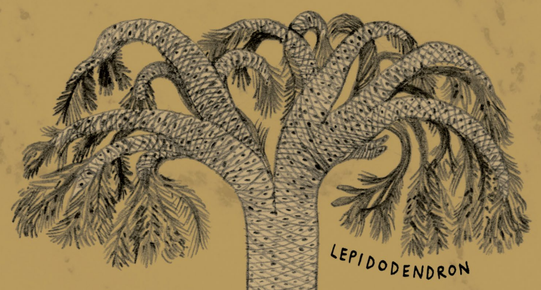
Beneath our feet, lie geological clues about our distant past and evidence of how life evolved on Earth. In Berwickshire and north Northumberland, the most common rocks are Carboniferous limestones, mudstones and sandstones. However, at Siccar Point, on the coast, you will find older rocks called greywackes. Farther south, are volcanic rocks at St Abbs and Eyemouth, and farther south still are the sandstone cliffs of Burnmouth. In the lowlands surrounding the River Tweed, the bedrock is covered by thick glacial deposits of clay, silt, and sand.

Embedded in these varied rocks, lie the preserved remains of invertebrates, plants and fish - fossils. Most excitingly, the fossils of tetrapods, the first four-legged animals to leave the sea and breathe and walk on land, were found here, along the Whiteadder Water and on the coast.

In this leaflet, you can find out: where the best local geology hotspots are, what amazing fossils have been found in our area, and who our 'Rock Stars' are (inspirational geologists, past and present).







Design & Illustrations
by Daniel J Weatheritt

LOCAL GEOLOGY HOTSPOTS

When out exploring always take care - don't take any risks with your safety!

Check the tide times and wear good, protective clothing.

1 Murphy's Beach

Observe the white sandstone cliffs at the bottom of the steps near the changing room ruins, which feature chisel marks leftover from quarrying - these rocks were used for lots of buildings in Berwick. Visit at low tide to see the cave entrances at the far end of the bay in the red sandstone cliffs.

NB: this beach is inaccessible during very high tide.

2 Berwick Beach / Greenses Haven

Explore at low tide to see domes and basins in the folded rocks on the shoreline. Observe fossil corals, shelled invertebrates, and crinoids in the curvy limestone beds, particularly near the foot of the steps.

3 Spittal Beach

Explore the beach to see fossilised trees and plants in the loose boulders, leftover from when the area was covered by Carboniferous forest. At the base of the rock face, there is a coal seam. Coal mining was once a thriving economy around the nearby Scremerston area.

NB: be careful of the orange mine water, which is acidic, and of cliff landslips, especially after wet and stormy weather.

4 Cocklawburn Beach

At low tide, walk northbound from the carpark along the beach to see fossil crinoids and many trace fossils of burrows in the folded limestone beds. Southbound, on the limestone pavements, enjoy more embedded fossil crinoids and trace fossils of burrows.

For detailed local walks leaflets, please visit: www.berwickshirerocks.org.uk

If you are lucky enough to see any really unusual fossils take photos in situ, with a ruler for scale - use the side of this sheet.

Measure it from all angles; note the location (What3Words) and contact your local museum or geology group.

Most fossils are best left in place, but the experts will advise.

Supported by Destination Tweed's Community Grants Scheme, which is made possible by The National Lottery Heritage Fund. Thanks to National Lottery players, the 'Berwick's Carboniferous Past' project has been able to undertake an intergenerational programme of activity inspired by the geology of north Northumberland and the Scottish Borders.

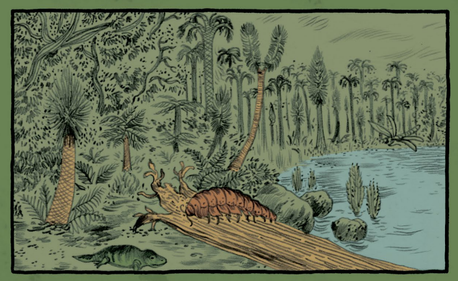
ROCK STARS

Inspirational Geologists Past & Present

Stan Wood (1939-2012) (A, B)

Fossil finding started as a hobby for Stan, but his natural abilities led to significant finds. Several of his discoveries are even named after him. *Woodesmus sheari*, a fossil millipede is one such example, discovered at Burnmouth. Perhaps Stan's most well-known finding is the *Westlothiana lizziae* (aka Lizzie) – the oldest lizard in the world. Stan, for many years, had been surveying the Whiteadder Water which led to the TW:eed project in 2015. Stan left a significant legacy, in that he found the fossils of creatures with four legs which first lived wholly on land and breathed air. He appeared on TV, with Sir David Attenborough, as 'Stan, Stan the Fossil Man'. He also opened a shop in Edinburgh's Grassmarket 'Mr Wood's Fossils' which you can still visit today. Matt Dale, current manager, has this to say about Stan –

'Stan was a bit of a hero in the world of palaeontology; independent, largely self-taught and enormously determined. His doggedness was a big factor in his great success as a fossil hunter – as well as having an innate sense of where fossils might be, he just kept going until he found what he suspected was there.'



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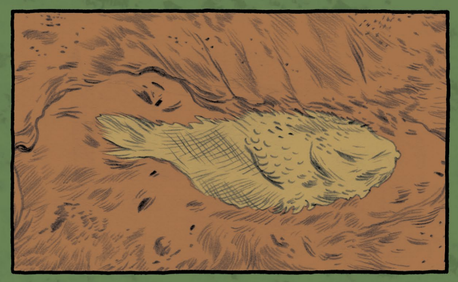


B

E

Mick Manning (E, F)

On an Autumn Day in 2007, the artist Mick Manning found a 350-million-year-old fossilised fish in one of the limestones on Cocklawburn Beach. It turned out to be a *rhizodont*, a three-metre-long predatory armoured lobe-finned fish that can now be seen in the Great North Museum: Hancock in Newcastle. Mick says:

'I was fascinated to think of Cocklawburn as a tropical swamp, and that when it was alive, this ancient and scary fish had been able to lunge onto land to grab prey. It actually inspired a book my wife Brita and I made a few years later called 'Prehistoric'. 'Prehistoric' is published by Otter Barry Books.

F

Rhizodont illustration copyright © Mick Manning & Brita Granström.

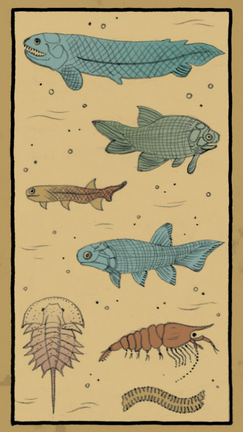
Albert Long (1915 -1999) (G)

Albert Long loved Berwickshire and its ancient natural history. From 1945 to 1966, Albert worked as a science teacher in Berwickshire High School and lived in Gavinton. He was a passionate beekeeper and active fossil hunter. Albert studied the fossils in local rocks and, in particular, took his attention to fossil plants in the Duns area.

He converted his honey house into a laboratory where he scientifically examined and recorded the structure of these fossilised plants, including previously unknown specimens which he had discovered across Berwickshire and Northumberland. He later became Deputy Curator of the Great North Museum: Hancock in Newcastle. Here he was able to focus upon his research into the evolution of flowering plants, believing them to have evolved from seedferns – this process he named as the 'Cupule-Carpel Theory'. Samples of his findings can be found in the National Museum of Scotland in Edinburgh and in the Great North Museum: Hancock in Newcastle. Albert died in Tweedmouth in 1999 having pursued his life's work with diligence and passion.

Thomas Ovens (1891-1912) (C)

As a teenager, just outside of his home in Foulden, above the Whiteadder Water, Tom found fish fossils, later named the Foulden Fishes. He found seven such fish fossil species – three of which were later proved to be unique to Foulden. They included rare and never seen before fossils: ray-finned primitive bony fish; large-scale complete predatory fish; and also lobe-finned fish, which are probable ancestors of amphibians. Despite Tom being an amateur, his findings were significant. Tom's fossils were studied by professional geologists, and some were excavated for safe keeping. Tom died at the age of 20, but many of his discoveries are now stored in the National History Museum in London and in the Great North Museum: Hancock in Newcastle. The churchyard at Foulden contains many old gravestones, including that of our Rock Star, Thomas Ovens.



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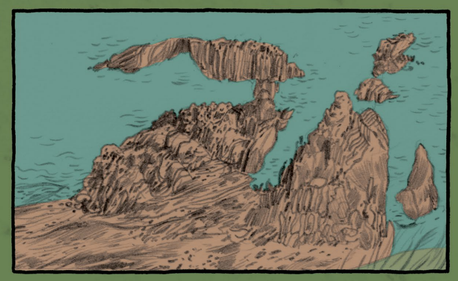
D

George Tate (1805-1871) (D)

Tate was born and raised in Alnwick and, despite little education, became an influential thinker and writer on the geology, biology and history of Northumberland and the Borders. He specifically focused on the geology and biology of the Carboniferous period. He studied and mapped the geology of north Northumberland, working out the older and younger rocks in the region, and established his own fossil museum.

He lived and worked in Fenkle Street, Alnwick, and his home can still be seen in the beautiful Georgian building at number 14, which is now a shop. He was one of the first people to recognise local glacial features in Alnwick and at St Abbs Head. He identified the hard rock underneath Bamburgh Castle as being the same rock as the Farne Islands, now known as the Whin Sill. George Tate is an outstanding example of a celebrated local figure who achieved greatness from his passion, and not through status and wealth.

GEORGE TATE



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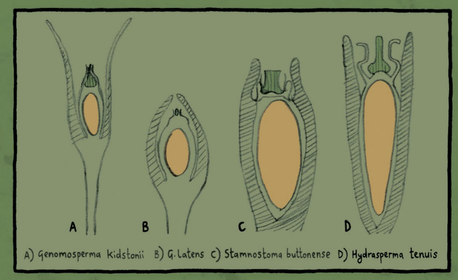

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James Hutton (1726 - 1797) (H)

James Hutton, was a cutting-edge thinker of the Scottish Enlightenment, developing new ideas about the Earth's processes and geological time. Hutton spent 14 years in the 1750s farming at Slighhouses, near Chirnside. He wrote in 1753 that he had *"become very fond of studying the surface of the earth, and was looking into every pit or ditch or bed of river that fell in his way."* He was observing carefully how landscapes were influenced by rain, wind and rivers, which led him to the realisation that Earth's processes in the past, were similar to now. With like-minded friends, he visited sites in Scotland which led him to think that geological time was considerably longer than had previously been thought. He searched for rock exposures in which groups of sedimentary rocks had been uplifted, folded and tilted, but then overlain by different groups of rocks, with a sharp division between the two, a feature that we now call an 'unconformity'. At Siccar Point in 1788, he recognised that the Earth was much more ancient than the current belief in the late eighteenth century. He later wrote,

"The result therefore, of our present enquiry, is that we find no vestige of a beginning – no prospect of an end."

Explore More:

Berwickshire Naturalists' Club www.bnc1831.co.uk | Berwickshire Rocks www.berwickshirerocks.org.uk

Geologists Association www.geologistsassociation.org.uk | Great North Museum: Hancock www.northeastmuseums.org.uk

James Hutton www.james-hutton.hutton.ac.uk | Mr Wood's Fossils, Edinburgh www.mrwoodsfossils.co.uk

National Museum of Scotland www.nms.ac.uk | Natural History Society of Northumbria www.nhsn.org.uk

Nature Scot www.nature.scot | Northumbrian Earth www.northumbrianearth.co.uk

'Prehistoric' in Otter-Barry Books www.otterbarrybooks.com

TW:eed Project www.tetrapods.org