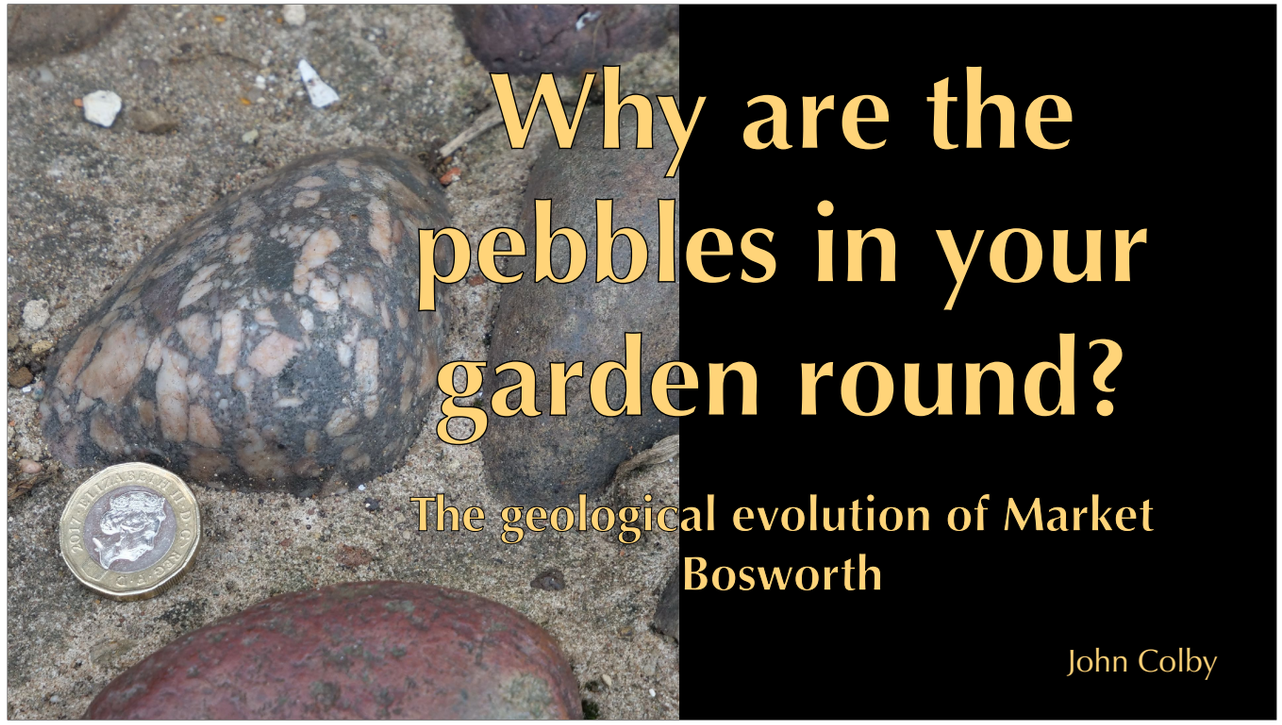

Bookmarks

On one side of the bookmark is a list of the geological periods with a mnemonic to remember their order, on the other side a timeline of the Pleistocene Ice Age with an indication of what our climate and environment was like.

Additionally you now have my contact details.

Two PDFs will be available after this talk, one with all the slides and one with the slides plus my notes and references.

John Colby November 2025

Evidential Research Topics

- Why is there no coal under Market Bosworth like there is to the north and south?
  - *There would have been but it's been gone for 280 million years.*
- What's with the rounded pebbles?

Two questions about Market Bosworth and geology:

Fiirst, why is there no coal under Market Bosworth? There is to the north and to the south but nothing underneath. The question is valid. There would have been as there was coal all over this area, but about 290 million years ago events took a different turn.

Second, many people have noticed that all the pebbles around here are rounded, not angular. We will be addressing that as well.

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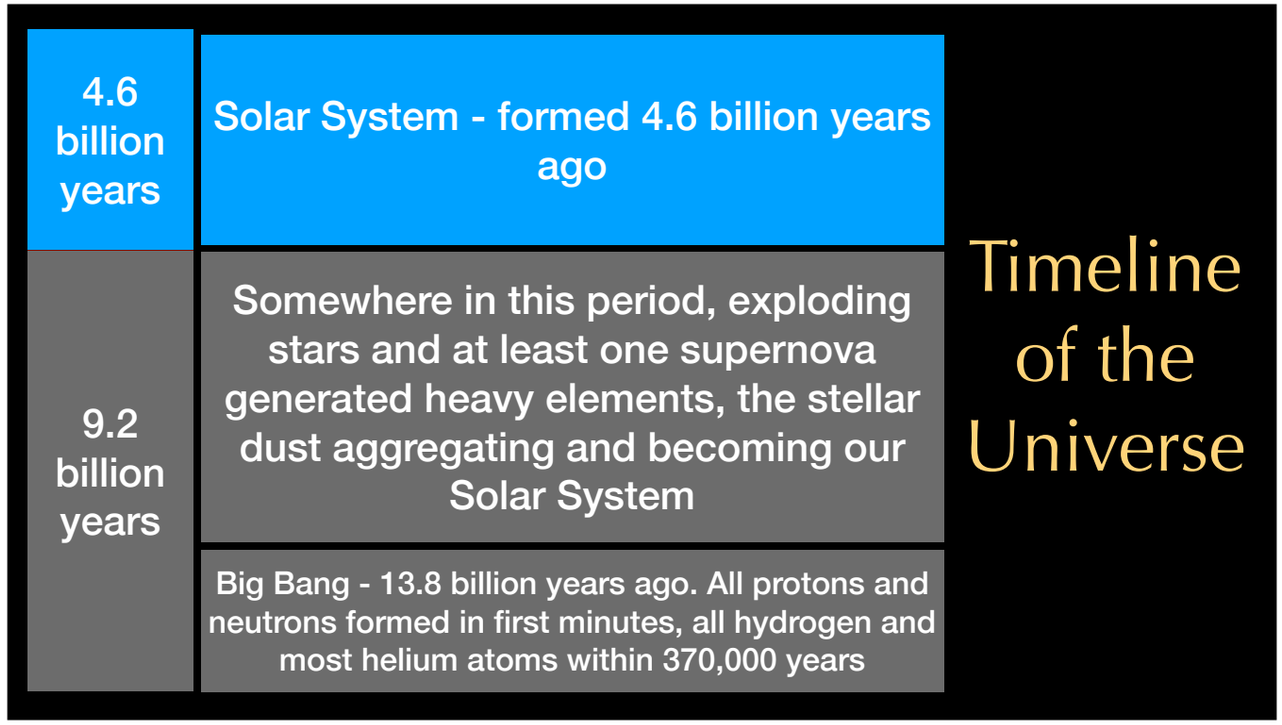

The universe formed from the Big Bang, an explosion of energy, which was very hot. Subatomic particles formed between about 10^{-12} and 10^{-6} second after the Big Bang, neutrinos, quarks, and electrons formed. Protons and neutrons began forming shortly after, from about 10^{-6} to 1 second after the Big Bang. Within about 3 minutes after the Big Bang, conditions cooled enough for these protons and neutrons to form hydrogen nuclei. after 380,000 years or so, the universe had again expanded and cooled enough for conditions to favor electrons staying in orbit around atomic nuclei. We get atoms.

The first stars in the Universe are believed to have formed only a few hundred million years after the big bang, from about 13.7 billion years ago.

Stars form age gather into galaxies, explode. I know many people just referred to a single supernova but there must have been a lot of star formation star explosion in order to get the elements formed that we know. Whatever happened the solar system coalesced from a former supernova about 4.6 billion years ago

Source:

Hawking, S, (1988), A Brief History of Time, Bantam, New York, Available from https://pubhtml5.com/hmeo/eogp/A_Brief_History_of_Time_by_Stephen_Hawking/113

https://www.astronomy.com/science/how-did-the-first-element-form-after-the-big-bang/

https://www.cfa.harvard.edu/news/making-first-stars#:~:text=The first stars in the,about 13.7 billion years ago.

Big Bang and protons https://en.wikipedia.org/wiki/Big_Bang

Solar System https://en.wikipedia.org/wiki/Formation_and_evolution_of_the_Solar_System

The process by which elements are created, primarily through stellar nucleosynthesis (in stars) and also during the Big Bang. The Big Bang created the lightest elements (hydrogen and helium), while heavier elements are synthesized in the cores of stars and during supernova explosions

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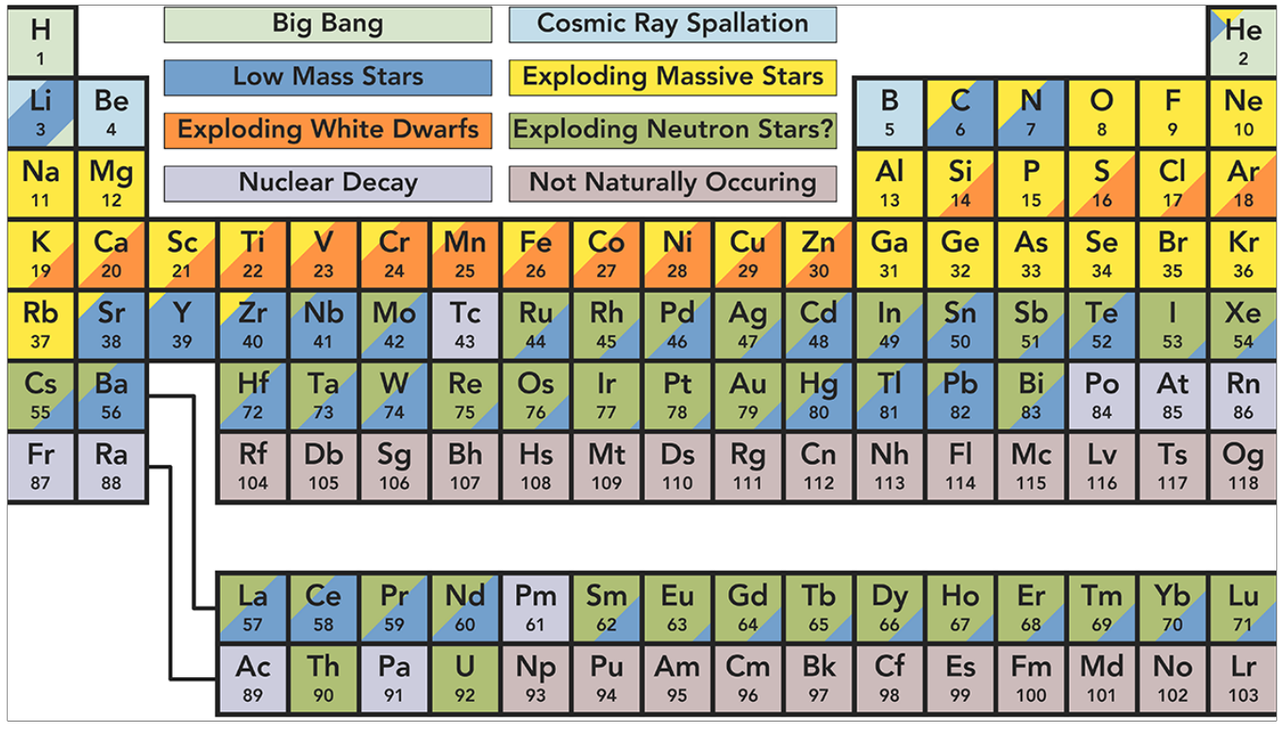

This periodic table of elements shows the formation requirements of each of the 92 naturally occurring elements

Sources:

https://www.visualcapitalist.com/visualizing-the-origin-of-elements/

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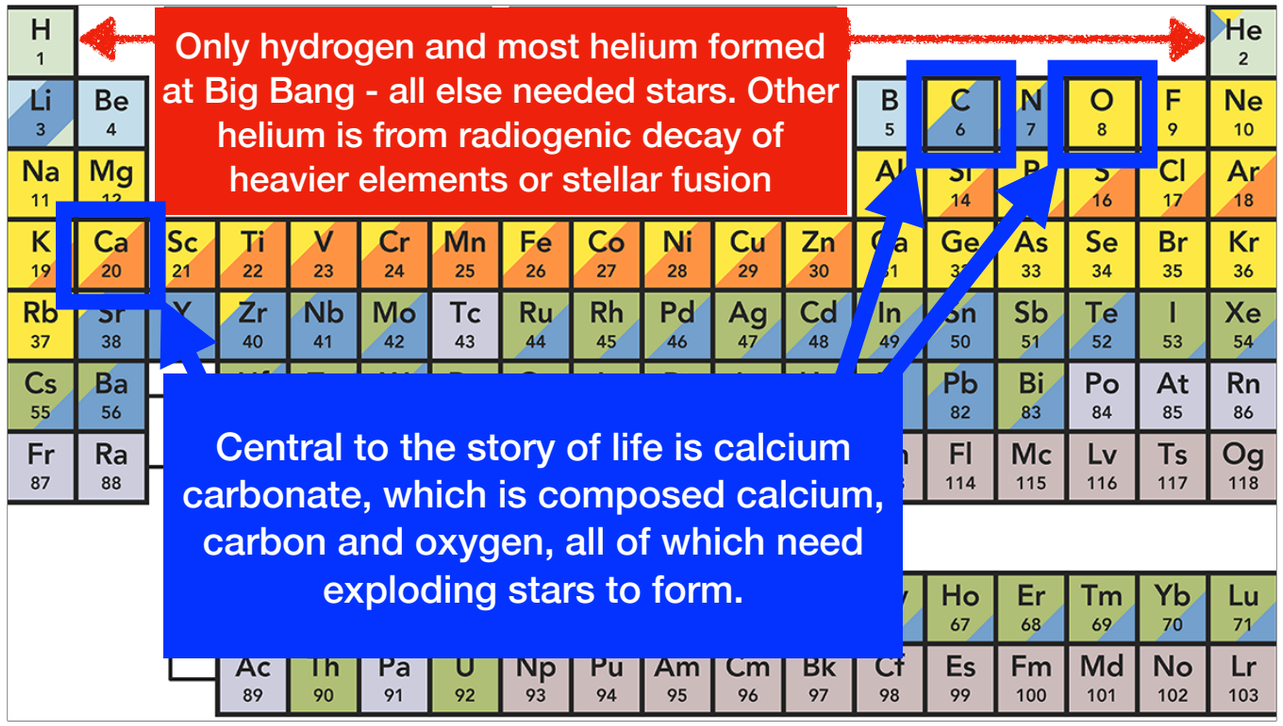

Only hydrogen and most helium formed at Big Bang - all else needed stars. Other helium is from radiogenic decay of heavier elements or stellar fusion.

Central to the story of life is calcium carbonate, which is composed calcium, carbon and oxygen, all of which need exploding stars to form.

Source:

https://www.visualcapitalist.com/visualizing-the-origin-of-elements/

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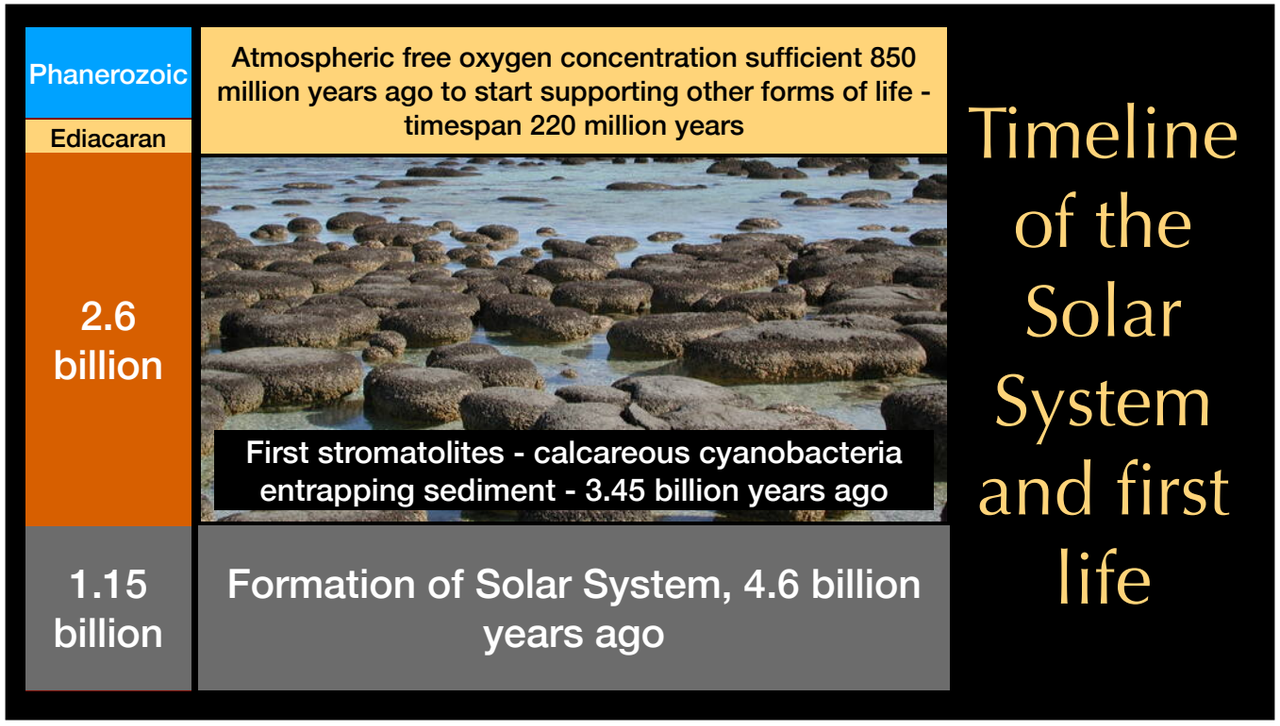

About 1.5 billion years after the formation of the solar system, bacteria evolved that perform photosynthesis, turning sunlight into energy. They are mounds of lime secreting cyanobacteria, a division of microorganisms that are related to the bacteria but are capable of photosynthesis. Cyanobacteria are prokaryotic and represent the earliest known form of life on the earth.

There are only two well-developed marine stromatolite areas in the world: in the Bahamas and at Hamelin Pool in the Shark Bay area of Western Australia. They were the only lifeform for more than half of the earth's history. Prior to that a fifth of earth's history was devoid of life.

It wasn't until 850 million years ago that sufficient atmospheric free oxygen concentration was available to start supporting other forms of life - which developed from 2% to 10% in 220 million years. It wasn't unit 400 million years ago that it reached 16%, where we'd struggle to breathe. Current concentration is 21%.

Sources:
Timeline https://www.bgs.ac.uk/download/discovering-geology-phanerozoic-timechart/
Stromatolites https://www.dmp.wa.gov.au/stromatolites-and-other-evidence-1666.aspx
Stromatolite image https://www.dmp.wa.gov.au/Images/Community-Education/GSWA_stromatolites_01_rdax_620x465s.jpg
Oxygen https://en.wikipedia.org/wiki/Geological_history_of_oxygen#:~:text=In the absence of plants,today's and probably fluctuated greatly.

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Pregnant	Precambrian	4.6 billion	Pregnant Camels
Camels	Cambrian	541 million	
Ordinarily	Ordovician	485 million	
Sit	Silurian	444 million	
Down	Devonian	419 million	
Carefully	Carboniferous	359 million	
Perhaps	Permian	299 million	
Their	Triassic	252 million	
Joints	Jurassic	201 million	
Creak	Cretaceous	145 million	
Possible	Paleocene	66 million	
Early	Eocene	56 million	
Oiling	Oligocene	33.9 million	
Might	Miocene	23 million	
Prevent	Pliocene	5.3 million	
Premature	Pleistocene	2.6 million	
Rusting	Holocene (Recent)	11,800	

Pregnant camels have got a lot to do with geology. The mnemonic, Pregnant Camels Ordinarily Sit Down Carefully Perhaps Their Joints Creak Possible Early Oiling Might Prevent Premature Rusting, refers to the sequence of geological periods from the the pre-Cambrian to the current. These are the periods and the dates.

Of these, they are only a couple which we're going to cover in this talk.

You have a bookmark with the detail of this and also the detail of the Pleistocene Ice Age chronology which we'll be dealing with later.

Source:

https://www.bgs.ac.uk/discovering-geology/fossils-and-geological-time/geological-timechart/

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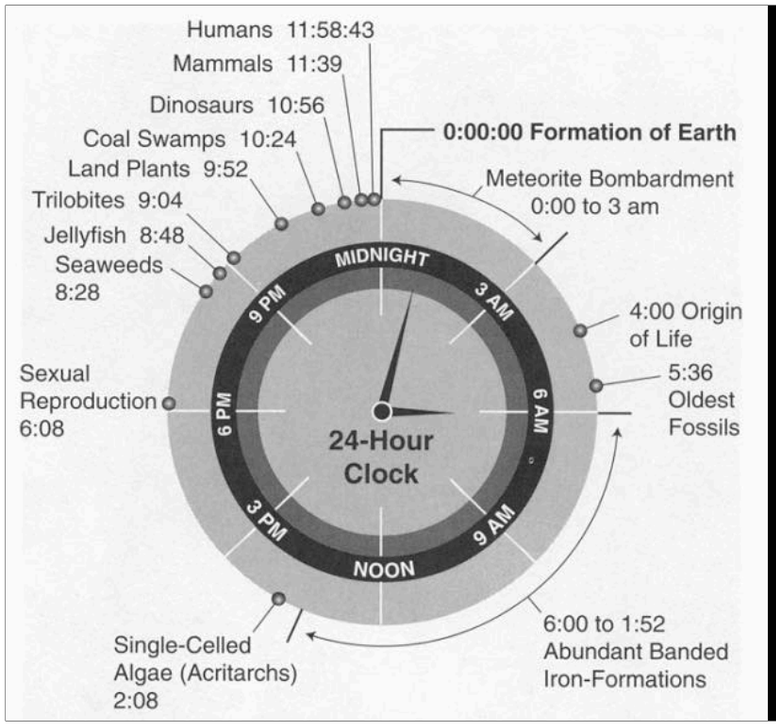

Solar System

Taking the timeline of the solar system as a 24 hour clock - we're dealing with periods at about 9pm, 10:24pm and a second to midnight.

Source:

https://www.facebook.com/photo/?fbid=2001644947298047&set=gm.10164757807899644&idorvanity=2417144643&__cft__[0]=AZWzvSh_MaAzmJYANEaa9Lxm-2FY6h8inrK7qMkIV5NpY6YYdOCFMBc7aSKBXZfT57X9Fi_bvtulwc4v0cvJ2X3AvOJiR3zKkFC97mdR1oAc_W8AuyRV_A0vV7XRXZMSptS-Ju23YT87VworLix4KFQxxML5p0nyipx73ga_0p51AvXk5kcY2evoLvvAa7omiobd_swavdfXn2EGn0RFA_n7&__tn__=EH-R

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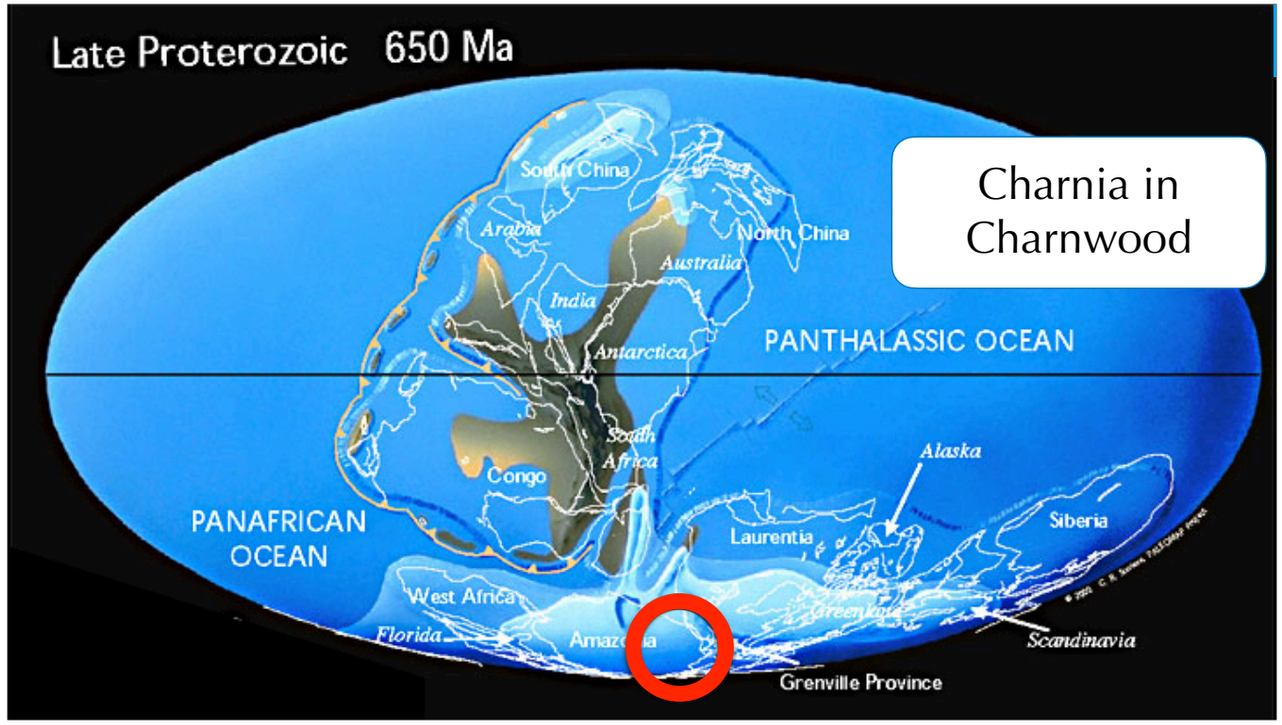

As we get to discussing life in our area about 650 million years ago, we were at the latitude between South Georgia and the Antarctic Peninsula today

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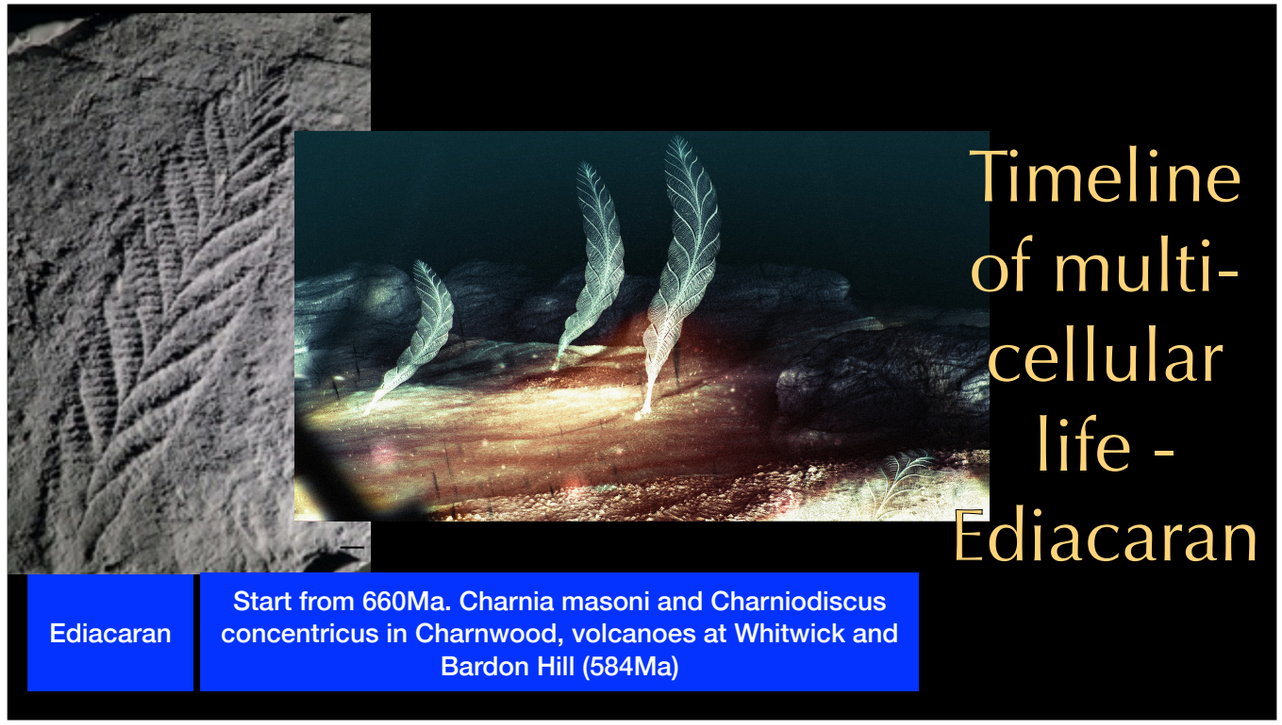

In 1957 during a climbing expedition in Charnwood Forest a then fifteen year old schoolboy, Roger Mason, noticed a leaf-like impression in the rocks. He took a rubbing, showed it to his father who approached Trevor Ford of the Department of Geology at Leicester. Trevor Ford described it and named it Charnia masoni, and located it in the Precambrian. That's the story, but subsequently it has become known that in 1956 prior to that, a schoolgirl, Tina Negus had spotted a similar fossil but her observation had been dismissed.

Charnia is significant as it was one of the first complex, macroscopic organisms recogniaed from the Ediacarian period in the Precambrian, living approximately 570 to 550 million years ago. Initially, its fern-like appearance led some to mistake it for an alga or plant, but this idea was discounted because it lived in deep water below the photic zone where photosynthesis could not occur.

Current phylogenetic analyses suggest that Charnia was a stem-eumetazoan, the group that includes most modern animals. It had a unique, fractal-like body plan and is considered to be a sessile, marine organism that fed on nutrients in the water, possibly through osmosis or filter feeding.

Charnia masoni are found in Charnwood Forest, Avalon and Bonavista peninsulas, Newfoundland, White Sea, Russia, Flinders Ranges, South Australia, Olenek Uplift, Siberia, Russia

Sources:

http://www.ediacaran.org/charnia-masoni.html

Charnia masoni, Charniodiscus concentricus https://www.thefossilforum.com/topic/127395-the-ediacaran-fossils-of-charnwood/

https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSo_oCUO43GTl5JorMLlVKfVhWxxuKtTx1f1U7l051lJAyIbAshwPenyLkYgelkP3xMl4A&usqp=CAU

https://forgetmachogrande.artstation.com/projects/1nLYaK

Classification: Charnia is considered an extinct genus of frond-like lifeforms belonging to the Ediacaran biota. Recent phylogenetic analyses resolve Charnia as a stem-eumetazoan, a group that includes all modern animals except sponges.
Not a Plant: Although it had a frond-like, fern-like appearance and was initially mistaken for an alga or plant, this interpretation was rejected because the fossils were found in deep-water environments, precluding the possibility of photosynthesis.

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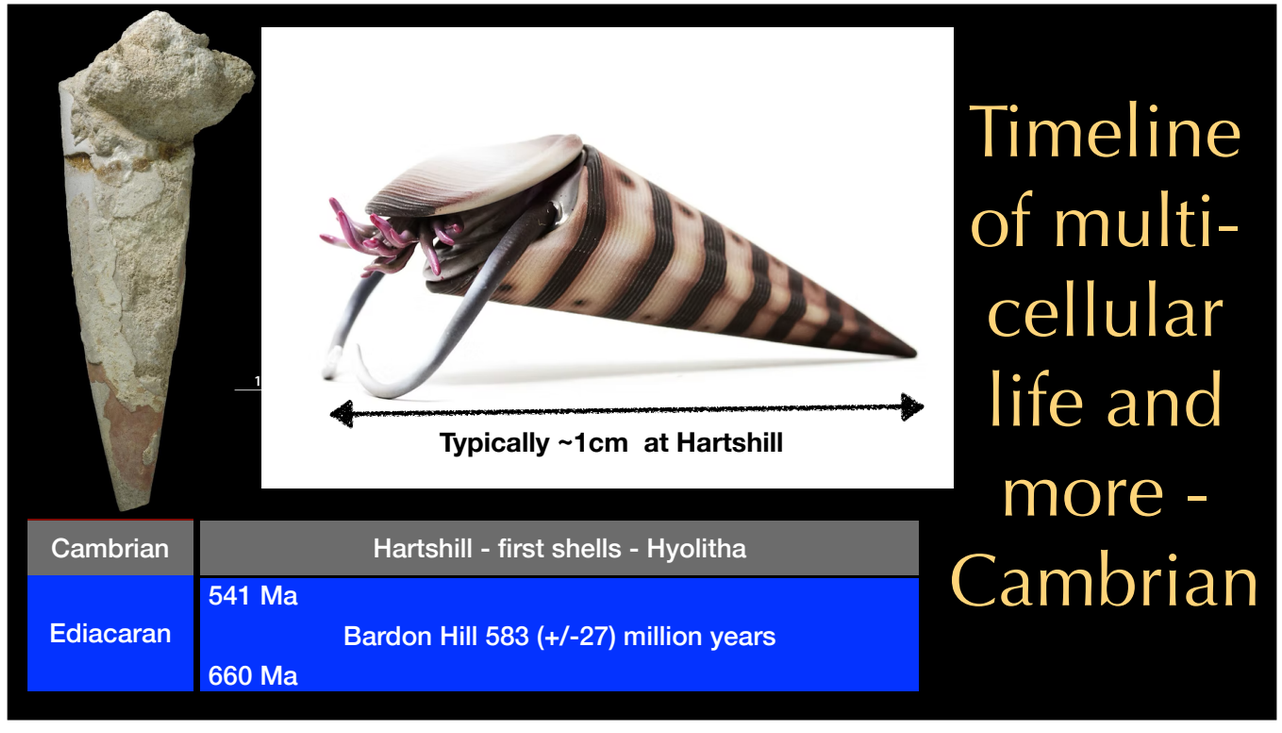

Fast forward quite a few tens of millions of years we get an environment where calcium carbonate is in sufficient concentration with enough free oxygen to allow animals to build skeletal material, shells. There is a Golden Spike location in Hartshil Quarry (Golden spike - where the first shelly fauna appear). This is the bottom of the Cambrian, after 541 million years ago, and the rather small shell of hyolith can be detected. The photograph is of one from the Burgess Shale, the ones I have seen at Hartshill are much smaller, around a centimetre long.

These predated the most easily recognised Cambrian beasties, the trilobite, by millions of years. The shell is the exoskeleton of the animal that lived inside, probably absorbing the calcium carbonate and excreting it to form a protective layer against predation. After death the shells were incorporated into the sediment and became rock.

Sources:

Hartshill Quarry - https://geoguide.scottishgeologytrust.org/p/gcr18/gcr18_woodlandsquarry

https://fossiilid.info/7548/specimens?mode=in_baltoscandia

https://en.scientificmodels.shop/pagina-prodotto/Hyolithes-cambriano

Hartshill https://www.researchgate.net/publication/259435022_Dating_the_Cambrian_Purley_Shale_Formation_Midland_Microcraton_England

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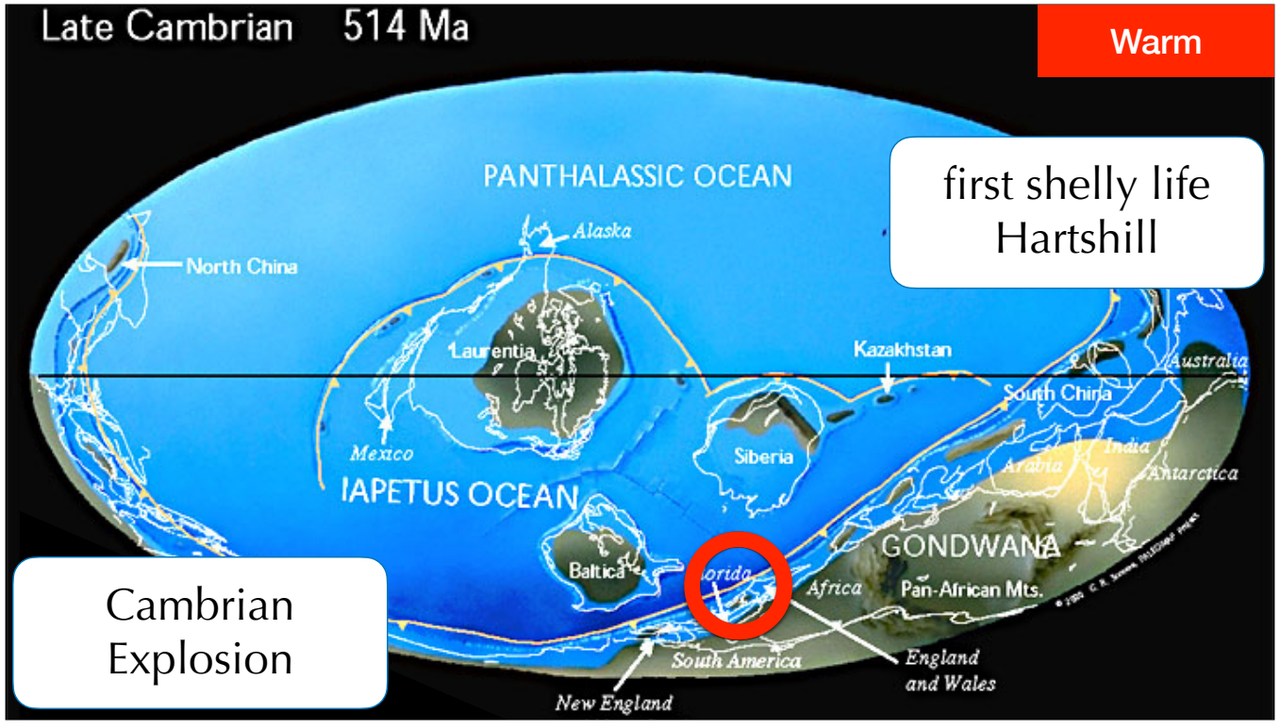

By now Britain had drifted north to about where the Falklands are today

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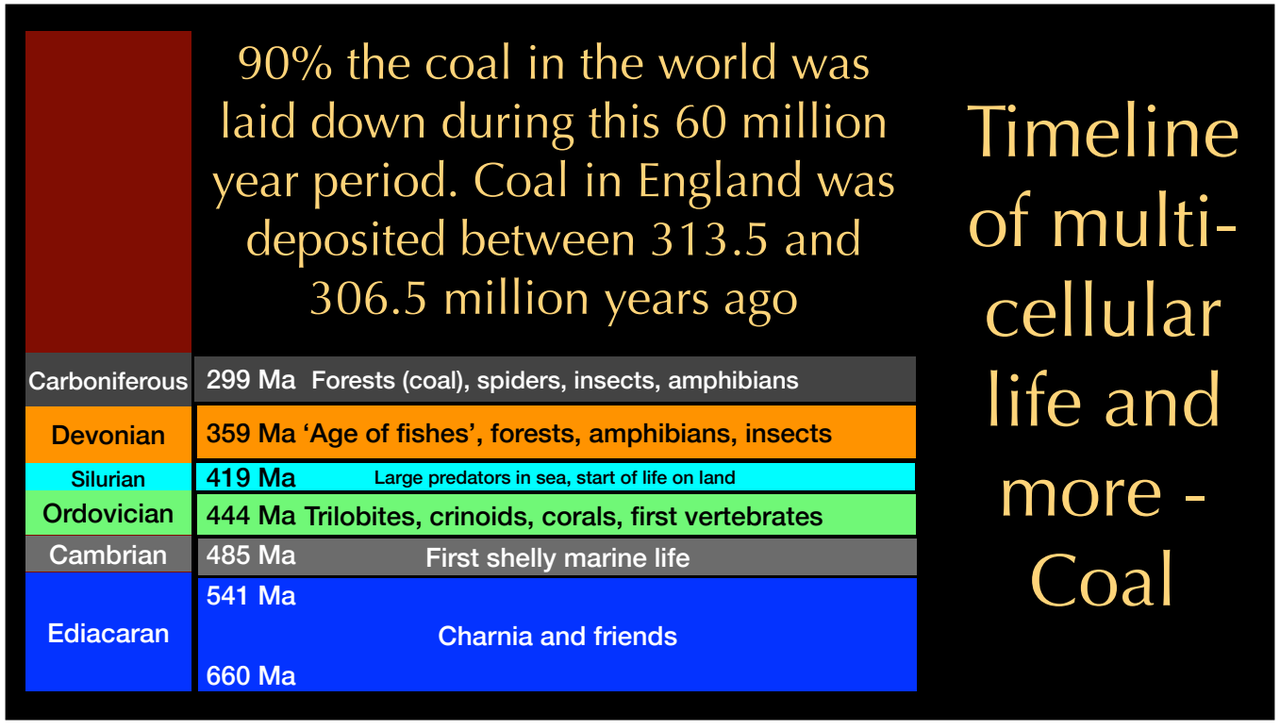

After the Cambrian, we are progressing through early stages of life through the evolution of marine organisms through plants through life emerging on to land and into coal which is formed in the Carboniferous.

Ordovician: After simple shells came segmented animals, the most well known being trilobites, and corals, exploiting the availability of carbonates, then vertebrates where skeletons had migrated inside the body.

Silurian: Large sea predators appeared and life migrated to the land.

Devonian: Fishes developed, and on land the first forests with amphibians and insects

Then we come to the Carboniferous, the first spiders and the environment where peat was produced which would later form coal. 90% the coal in the world was laid down during this 60 million year period. Coal in England was deposited between 313.5 and 306.5 million years ago.

Source:

https://www.bgs.ac.uk/discovering-geology/fossils-and-geological-time/geological-timechart/

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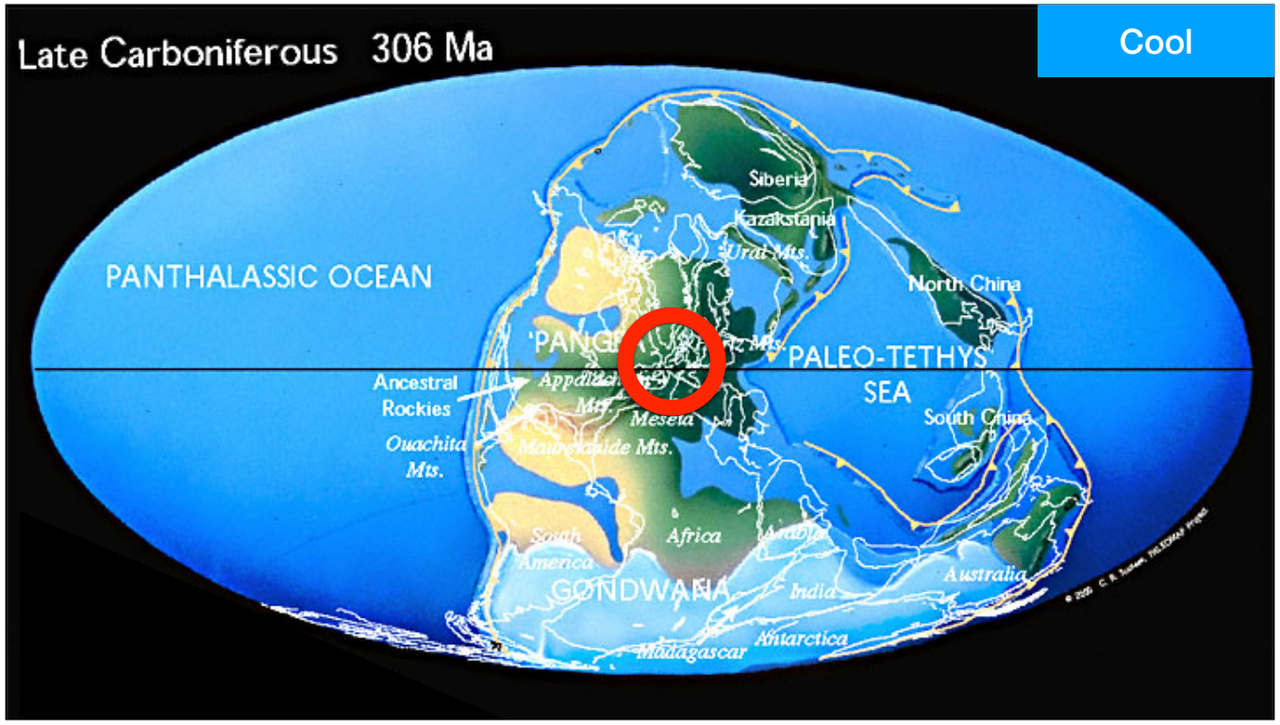

In the Carboniferous Britain is located somewhere near the equator in tropical rainforest country. Also relevant to our narrative is the repeated glaciations in the south of Gondwanaland

Source:

http://www.scotese.com/earth.htm

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Coal Source

- Caledonian Orogeny 490–390 million years ago, Iapetus Ocean Closure, building of Scottish and Appalachian mountains
- Mountain building created large range of mountains - Himalayan size - which eroded rapidly
- Heavy weathering - lots of rain - rain forest - we were equatorial
- Deltas, lagoons, vegetation, anoxic environments, giant ferns
- Tree ferns fell into lagoons, did not decay and became peat
- That became coal because sea level rose, more rocks were deposited, and the peat was buried and compressed

An orogeny is a mountain building episode caused by the closure of an ocean basin. The Caledonian Orogeny 490–390 million years ago, from the Iapetus Ocean Closure, built the Scottish and Appalachian mountains

This mountain building created large range of mountains - Himalayan size - which eroded rapidly

And being in the tropics there was heavy weathering - lots of rain - a rain forest - we were equatorial

The environment was deltas, lagoons, vegetation, anoxic environments, giant ferns.

Then they died, ferns fell into lagoons, did not decay in the anoxic environment and became peat

That became coal because sea level rose, more rocks were deposited, and the peat was buried and compressed

Source:

Caledonian Orogeny https://en.wikipedia.org/wiki/Caledonian_orogeny

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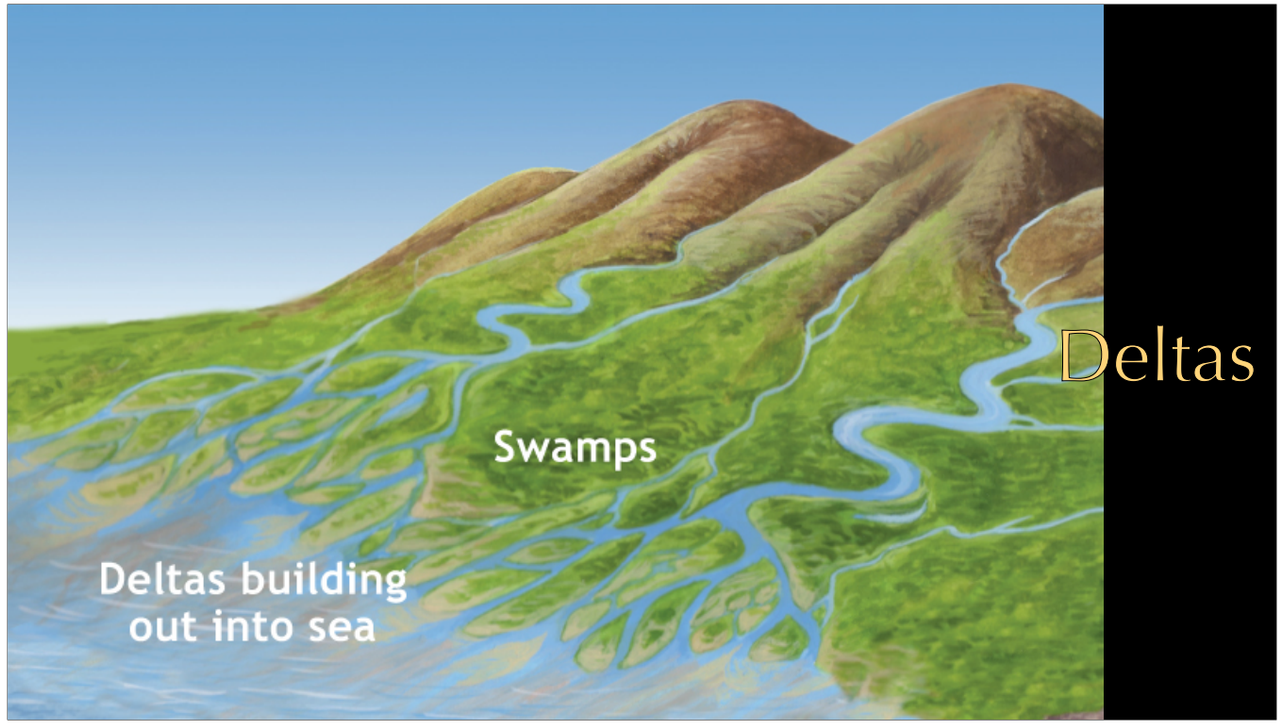

This a representation of the deltas which stretched from the centra valley of Scotland and across all of northern England, down across the Midlands and into Wales. They built out into the sea which was shallowing as the sediment filled up.

This diagram represents several hundred miles in extent, from Northern Scotland to Somerset and Kent.

Source:

https://dalesrocks.org.uk/westmorland-dales/life-in-the-tropics/sea-change-and-cycles/

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Cycles

- Permo-Carboniferous glaciation, 360 to 260 million years ago
- Centered on the southern supercontinent of Gondwana
- Period of low atmospheric CO_2 caused by the intense burial of carbon in coal swamps.
- Glacial periods punctuated by warmer interglacial periods, similar to the Pleistocene.
- Northern hemisphere was largely desert.
- Formation ice sheets caused a significant drop in global sea levels rising again in warmer periods
- Glaciation driven by a decrease in atmospheric CO_2
- No greenhouse effect
- Evidence for glaciations includes tillites and striations across southern continents.
- Despite the cold in the south, massive coal deposits continued forming in tropical and northern parts.
- The ice age eventually ended with greenhouse warming.

Permo-Carboniferous glaciation, 360 to 260 million years ago centered on the southern supercontinent of Gondwana. This caused dramatic drops and rises in sea level.

Linked to a period of low atmospheric CO2 caused by the intense burial of carbon in coal swamps.

Glacial periods were punctuated by warmer interglacial periods, similar to those seen in the Pleistocene.

The northern hemisphere was largely desert during this time.

The formation of the ice sheets caused a significant drop in global sea levels.

Sea levels rose again in warmer periods

Glaciation driven by a decrease in atmospheric carbon dioxide which was caused by the intense burial of organic carbon in the vast coal swamps.

Evidence includes against bedrock s, rock formed from glacial debris, and striations, marks where ice transported rocks scraped over bedrock, across then southern continents.

Despite the cold in the south, massive coal deposits continued to form in the tropical and northern parts of the world. The tropics were still working.

The ice age eventually ended with greenhouse warming and increasing atmospheric CO2

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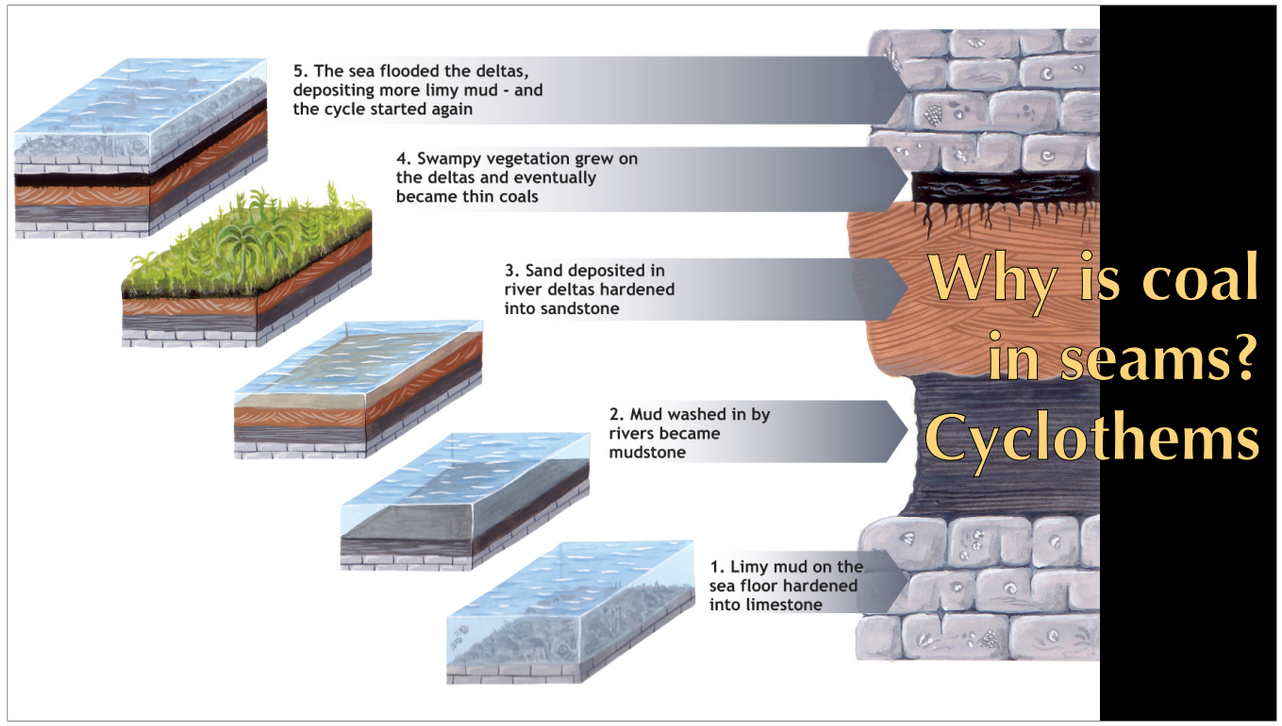

Coal was deposited in cycles.

First came the limy muds supporting reef life, corals, crinoids and brachiopods which needed clear water to survive, limy muds that in some cases became coral reefs with abundant life and eventually became limestone. This was all in clear tropical water.

As erosion of the land continued, the finer products of erosion came and blanketed the corals and other life, killing them. The seas were shallowing owing to deposition and deltas were growing. The muds and clays here deposited became mudstone.

Later on as more land erosion took place coarser sediment, which did not carry as far into water, covered then muds, and finally, sand which became sandstone.

When the depositions of the sediments had reached a point when plants, giant ferns at this time, would start to grow, came the swamps as the roots trapped sediments. The plants died and eventually became peat, and those later became coal after burial and coalification.

And then sea level rise rose, drowned the swamps, and the cycle started again. Sea levels changed and the peats became buried, limy muds were again deposited, and the cycle begins again. What caused the sea level to fluctuate as the repeated glaciations in the southern continent of Gondwana

Then it’s rinse and repeat..

Source:

https://dalesrocks.org.uk/swaledale/carboniferous-layers-of-the-landscape/changes-and-cycles/

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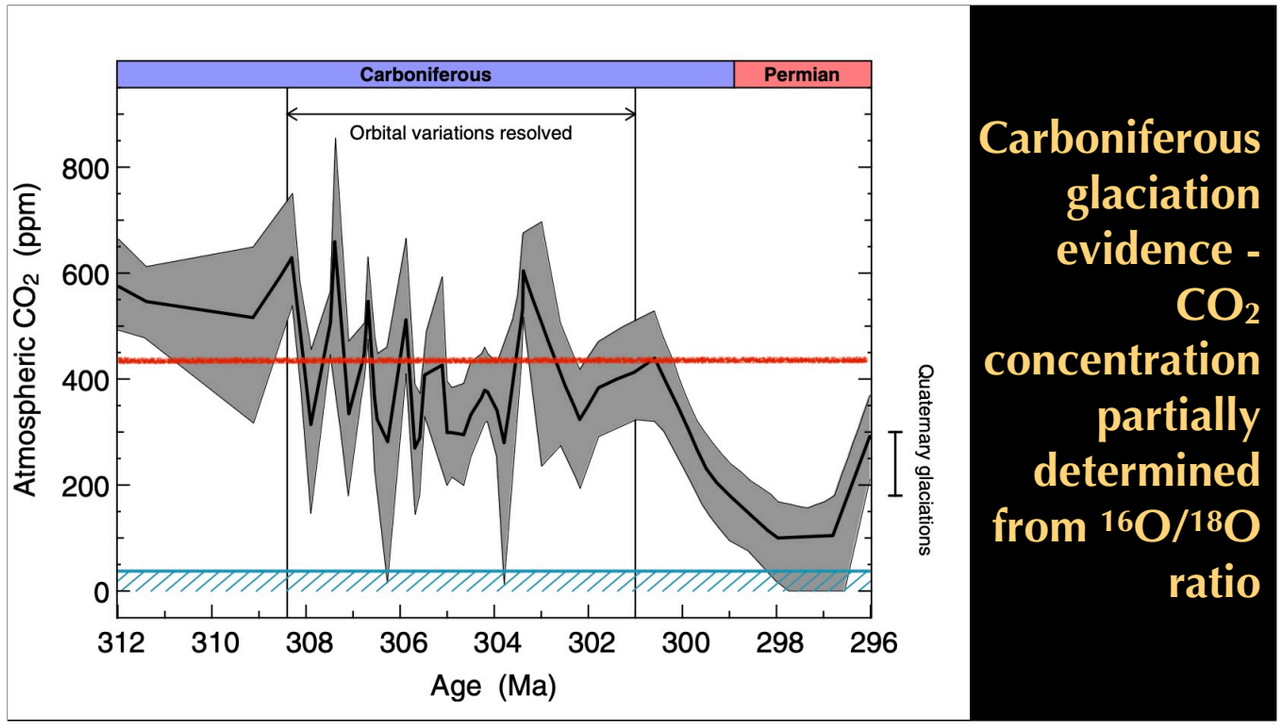

Carboniferous glaciation evidence - CO_2 concentration partially determined from $^{16}O/^{18}O$ ratio

Carbon dioxide concentration - lower CO2 - reduced greenhouse - colder

Oxygen isotope determination

Oxygen isotope analysis of ice cores uses the ratio of two oxygen isotopes, ^{16}O to ^{18}O, to reconstruct past climates. During colder periods, the lighter ^{16}O evaporates more easily and is preferentially locked into glaciers, which makes the remaining ocean water and the precipitation that forms ice richer in ^{18}O. The ratio of $^{16}O/^{18}O$ in fossils is the diagnostic, and is associated with determining the CO_2 atmospheric concentration

Source:

https://www.pnas.org/doi/epdf/10.1073/pnas.1712062114

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- The key precursor in the formation of coal is the formation of peat. It takes ten metres of peat thickness to form a metre of coal.
- The peat is compressed by the weight of developing rocks above.
- The rate of peat formation in modern peatlands is about a metre in 1,000 years
- Accumulating 10 meters of peat in the Carboniferous period would have taken between 105,000 and 1,000,000 years, which is ten to a hundred times longer compared with modern peat accumulation.
- Recent research indicates that the thick coal seams from this era formed over extensive periods due to unique conditions, such as stable, waterlogged landscapes that sustained peat growth over a prolonged, low-rate subsidence.
- Thick peat accumulation in the Carboniferous depended on a specific “climate window of opportunity” where landscapes were able to maintain high water tables and stable conditions over vast time scales.
- This was facilitated by a low rate of subsidence, allowing peat to build up without being buried by sediments.

Peat

Coal starts off as peat.

It takes ten metres of peat thickness to form a metre of coal.

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The peat is compressed by the weight of developing rocks above.

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Thick peat accumulation in the Carboniferous depended on a specific "climate window of opportunity" where landscapes were able to maintain high water tables and stable conditions over vast time scales.
This was facilitated by a low rate of subsidence, allowing peat to build up without being buried by sediments.

The mathematics is fairly straightforward. This 25mm lump represents:

250mm of peat deposited in the Carboniferous swamps

These swamps were then buried

The subsequent compression is at a ratio of ten to one caused by a series of overlying rocks formed in the deltas

The deposition of the ten inches (250mm) of peat would take between 2,650 and 25,000 years based on timescales found online

Coalification

Coalification is the process of converting peat into coal. It requires heat and pressure

Under this regime peat turns first to lignite, brown clay, then into sub-bituminous coal, then bituminous coal (the most common and what this lump is) and finally anthracite.

Temperatures involved are 35°C to 80°C for lignite increasing to anthracite requiring a temperature of at least 180°C to 245°C.

Temperature is more important than ether pressure or time of burial. The whole process takes a long time, 300 million years or more

Source. https://en.wikipedia.org/wiki/Coal

We’re not talking simple here - we’re talking a unique set of circumstances that fuelled the Industrial Revolution. We wouldn’t be at the point we are in technology without that unique set of circumstances.

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- Variscan Orogeny 380 to 280 million years ago, Cornubian granites and The Lizard Ophiolite, Mountain building in Europe
- Bending in our area
- Market Bosworth Anticline - brittle rocks crack
- Erosion - removes anticline
- Deposition of Permo-Trias Desert

In the period after deposition of coal

Variscan Orogeny 380 to 280 million years ago, Cornubian granites and The Lizard Ophiolite, Mountain building in Europe

Bending in our area - Market Bosworth Anticline - brittle rocks crack

Erosion - removes anticline

Deposition of Permo-Trias Desert

Variscan Orogeny https://en.wikipedia.org/wiki/Variscan_orogeny

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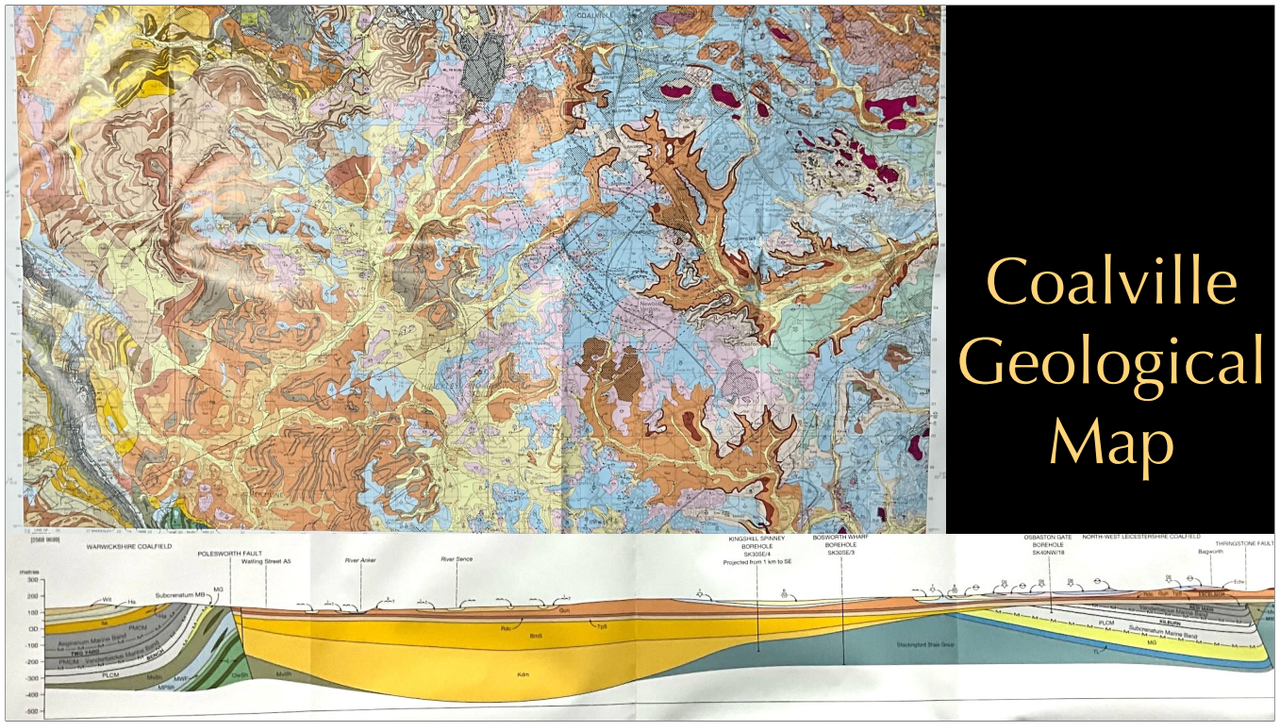

This is the source information

Source

Coalville (B&Sup) [Folded Map]
Price £12.00 (no VAT)
Format Folded Map
ISBN 0751835676
Scale 1:50 000
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Version B&Sup
Year Published 2010

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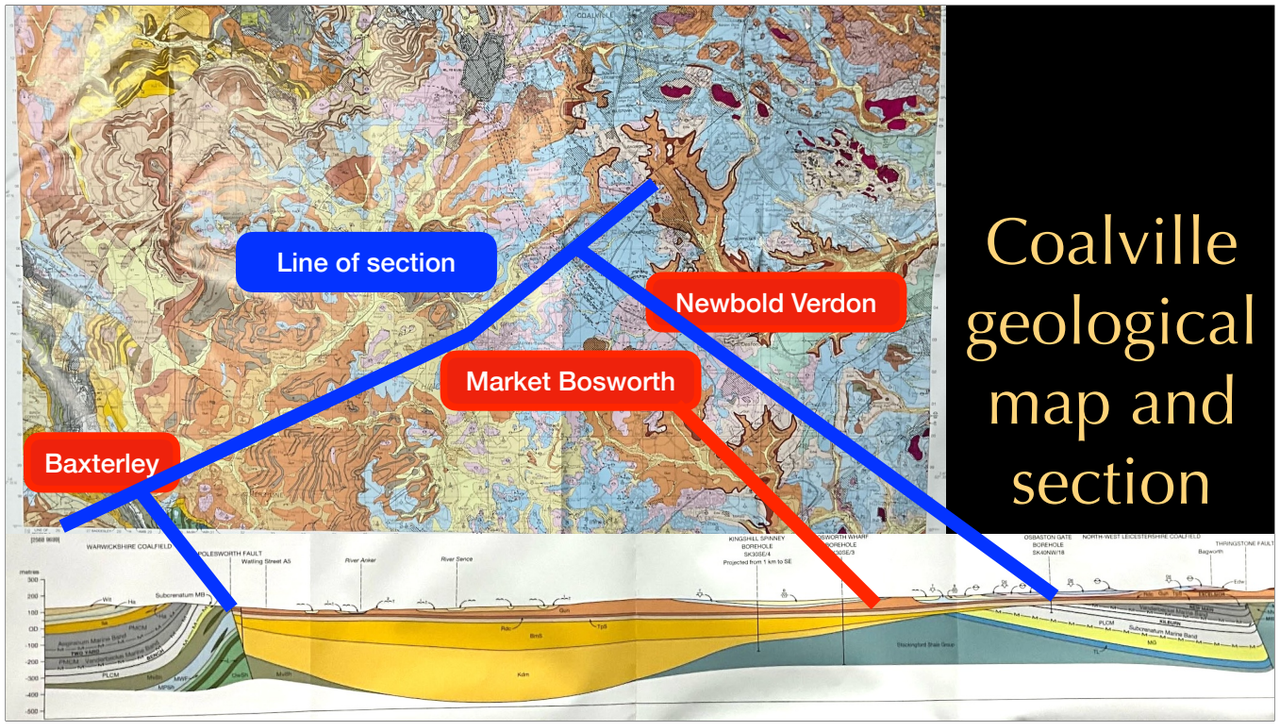

Let’s put some locations

Baxterley, west of Atherstone

Market Bosworth

Newbold Verdon

Line of section

Folding evidence

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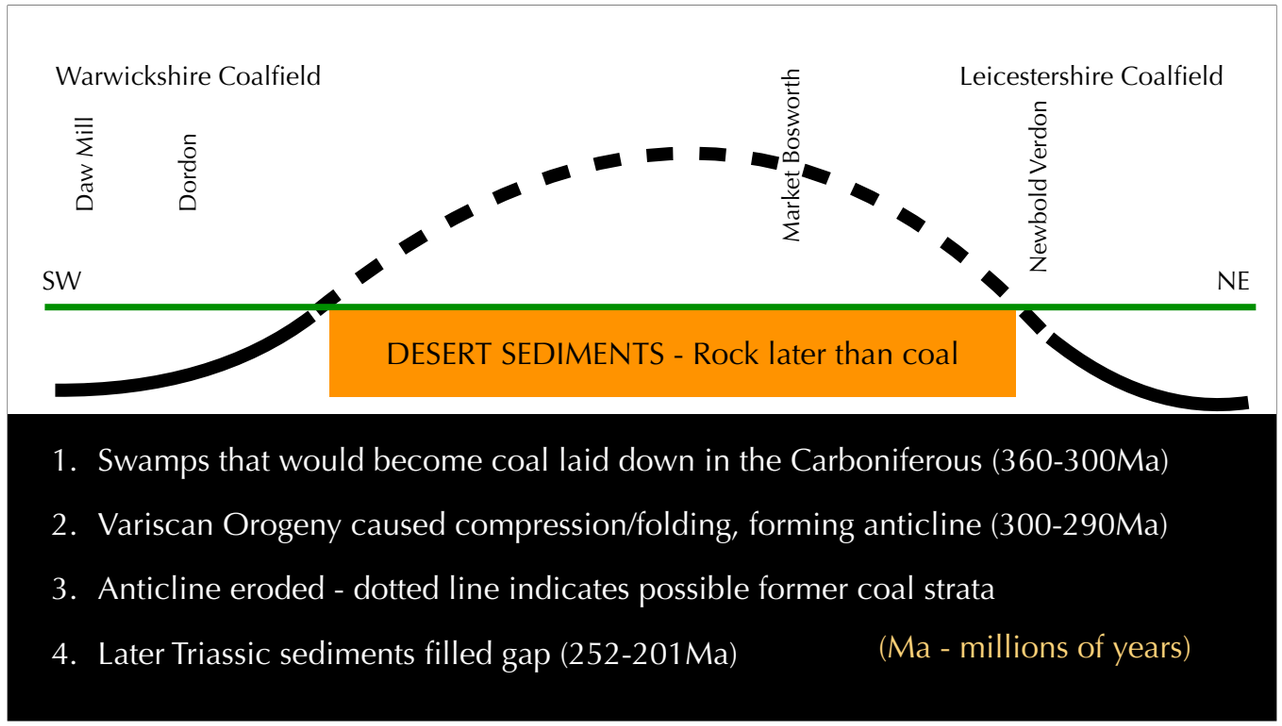

Peat accumulation

Coalification

Variscan orogeny compression

Anticline erosion, removing coal and associated deposits, except for pockets

Desert sediments filled the hole.

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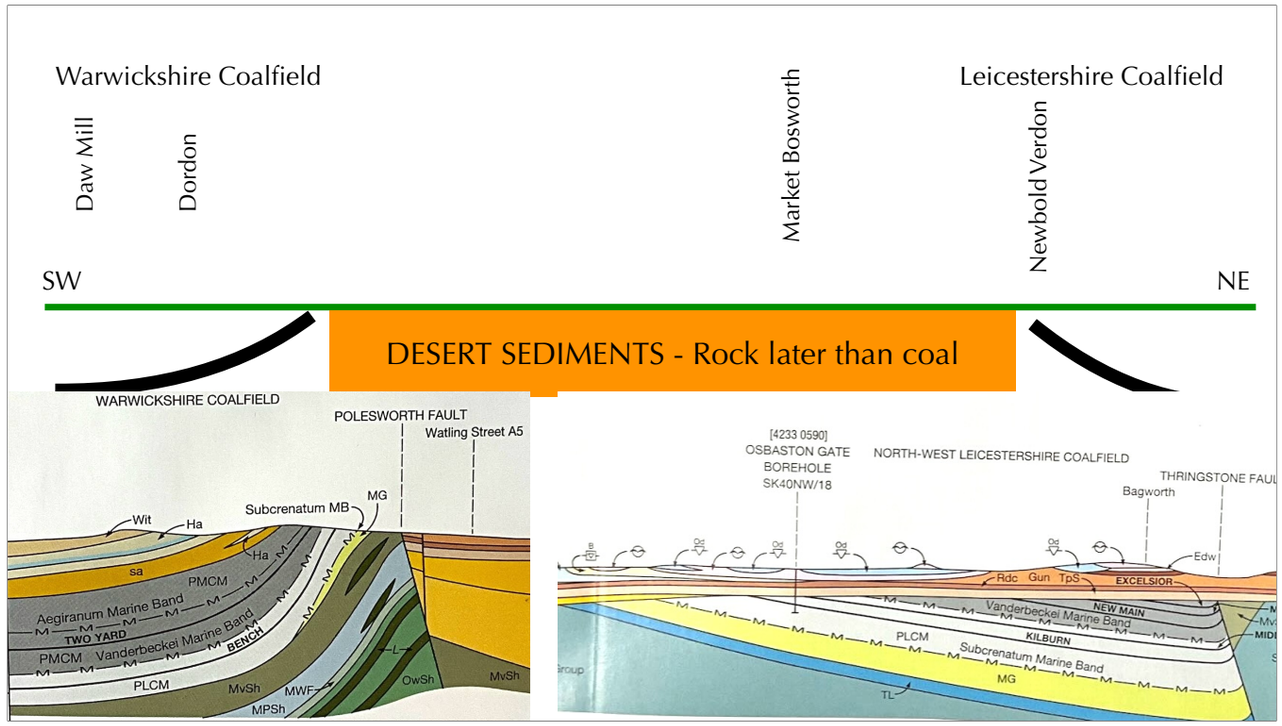
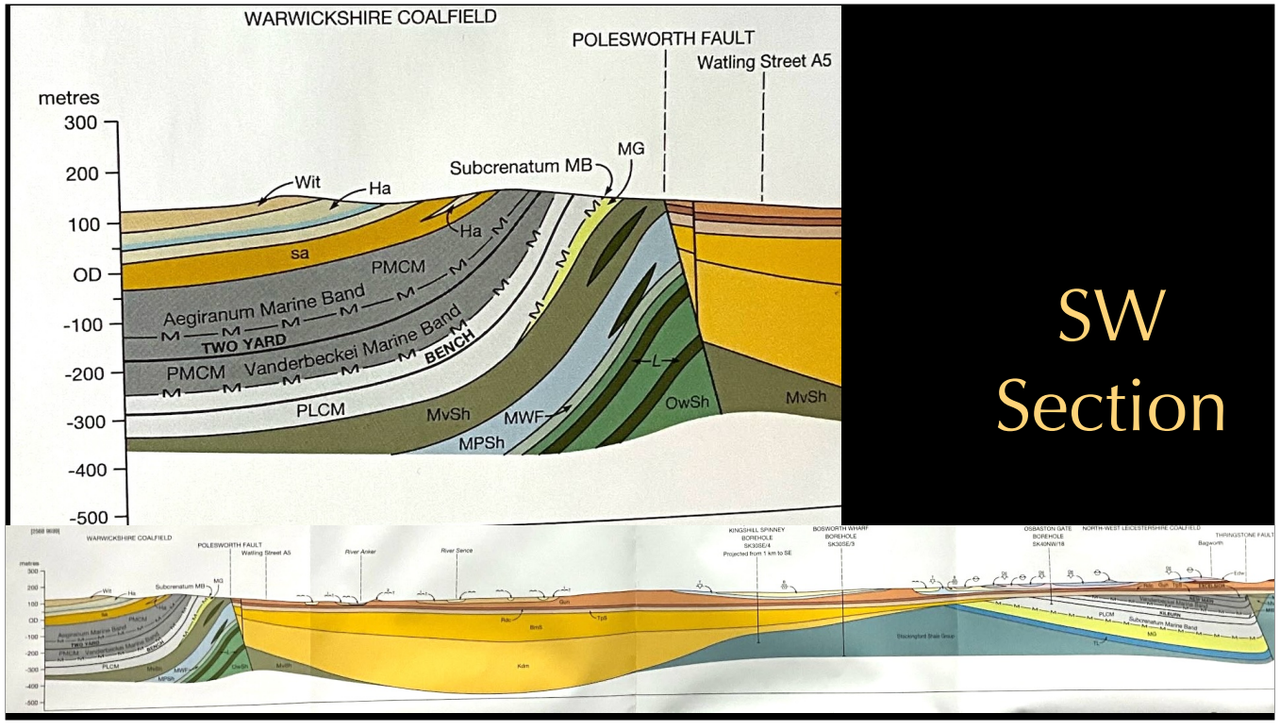


Bit larger detail of sections

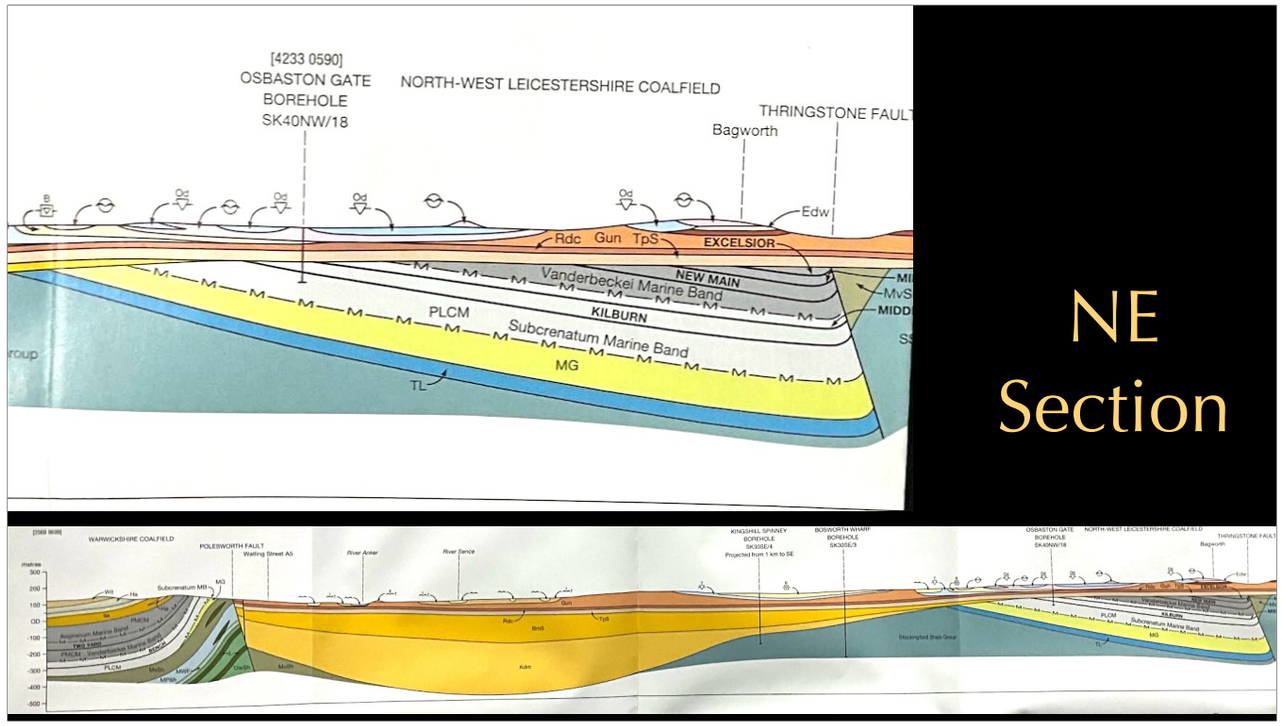
John Colby November 2025



In the south west faulting and folding, all due to Variscan orogeny.

Dordon mine now and industrial park

John Colby November 2025



Dragon Lane, Newbold Verdon, opposite Dragon pub, now the surgery

More than 40 years ago houses were built there, and two never sold because the shallow mine workings below collapsed and the houses were fenced off. They remained in that state for decades and new houses (hopefully with foundations that take account of the subsurface) were built

Lets hope the new estate at Newbold has taken this into consideration.

Other evidence

Desford Colliery Band - a name that still exists and they are National Brass Band Champions of Great Britain 2025

Mines rescue at Wilnecote

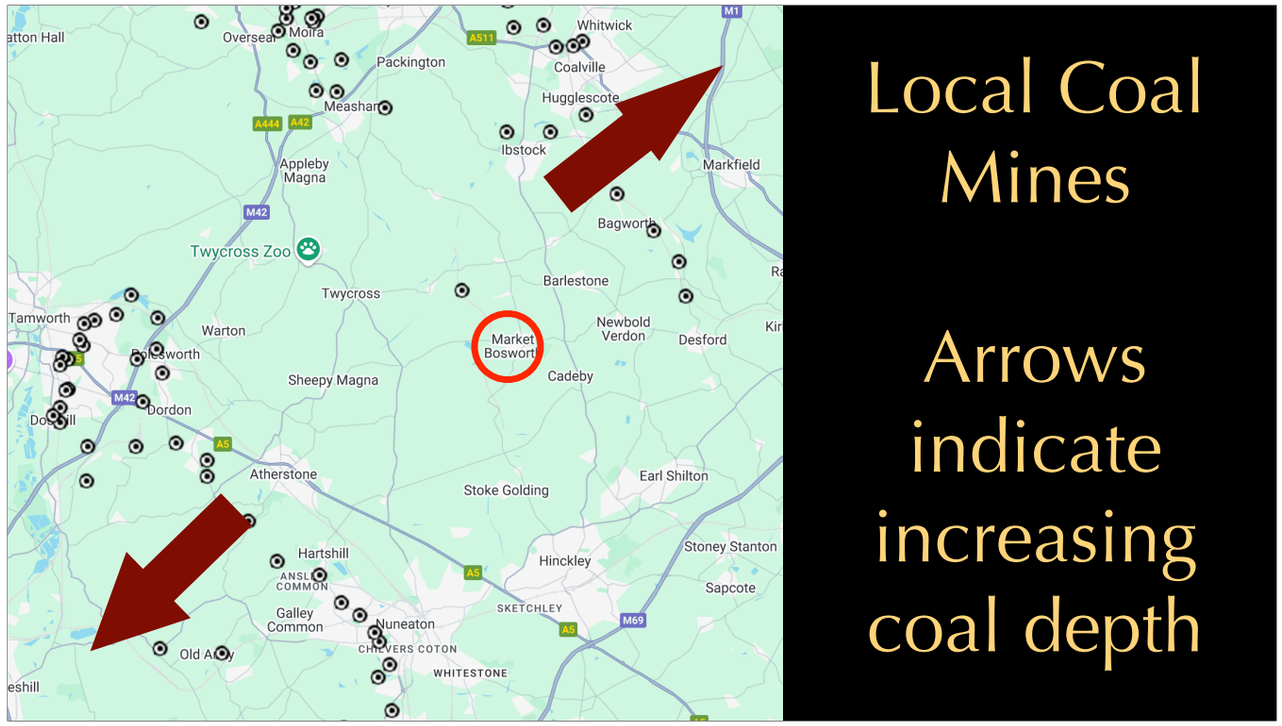
Medieval mining at Lount, then opencast

John Colby November 2025

Ibstock draglines surface workings, closed 1996

Surface workings to north of Ibstock - Sence Valley

John Colby November 2025

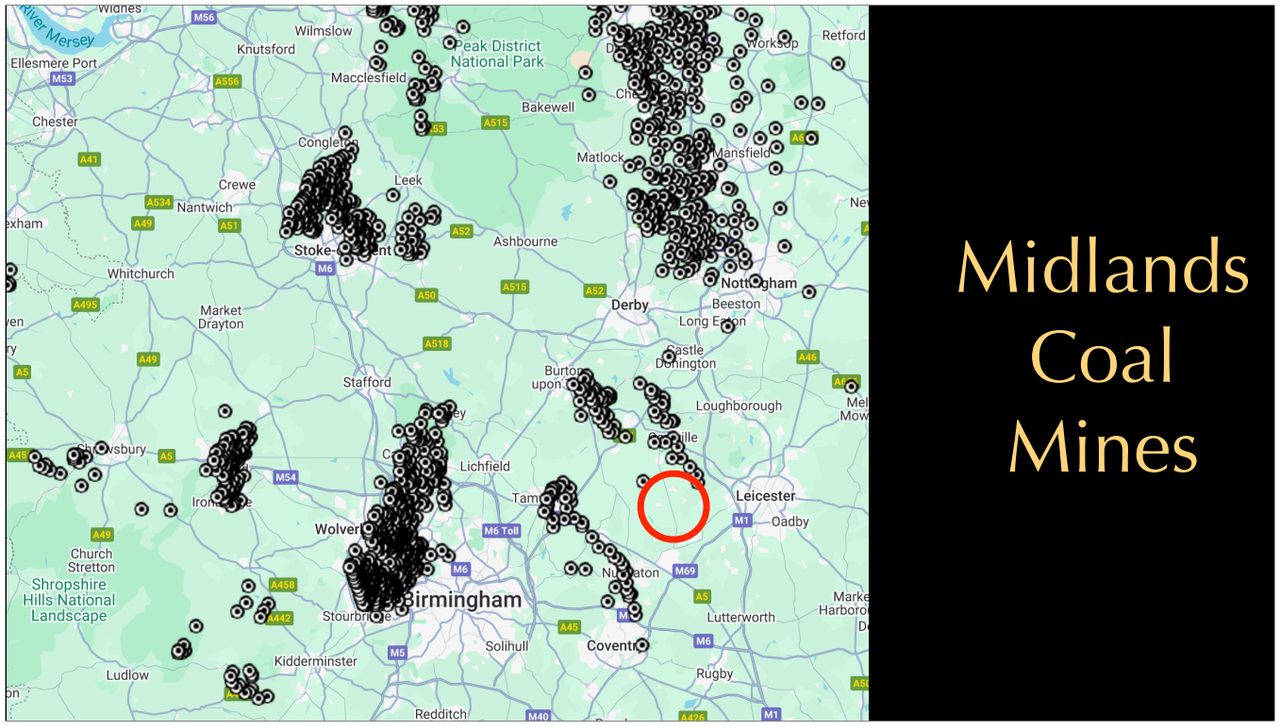


Map of the town mines in the area

Source:

Coal Map https://nmrs.org.uk/mines-map/coal-mining-in-the-british-isles/collieries-of-the-british-isles/coal-mines-england/

John Colby November 2025



Regional coal mines

Source:

Coal Map https://nmrs.org.uk/mines-map/coal-mining-in-the-british-isles/collieries-of-the-british-isles/coal-mines-england/

John Colby November 2025

On the 11th Baronet from Peter Loseby

A diary entry recorded by the 11th Baronet on the 19th January 1876.

"Went to the Geological Society to discuss the results of a drilling operation that had taken place in Bosworth. The results suggested that there was a thick seam of coal 1000 feet below the surface. He recorded that he hoped to start extracting within twelve months"

Whilst Sir Alexander mentions Bosworth he did not give a specific location nor did he commence the mining operation.

The question can be asked why didn't he start to mine the coal. It has been suggested by other researcher who were not privy to the diaries that the drilling took place in a desperate hope of saving him from bankruptcy but no coal was found.

In 1876 Sir Alexander was not short of funds and could have set up a company to run the operation similar to the Risca company of which he was a director.

My feelings are that the pithead could have been in Park but he was reluctant to look out from the Salon in the Hall which had been scarred by the pithead and spoil heap.

He was already receiving an income from the Selston coalfield in Derbyshire which lay in his estate, so he was not inclined to establish further mining operation. When his financial state became precarious it was too late to take on the expense of establishing the mining operation.

Received during the afternoon of 20 November 2025 from Peter Loosely

John Colby November 2025

When I bought my house in 1984 the (then) National Coal Board confirmed there was no coal beneath

The geological map and cross section gives no indication of coal beneath Market Bosworth

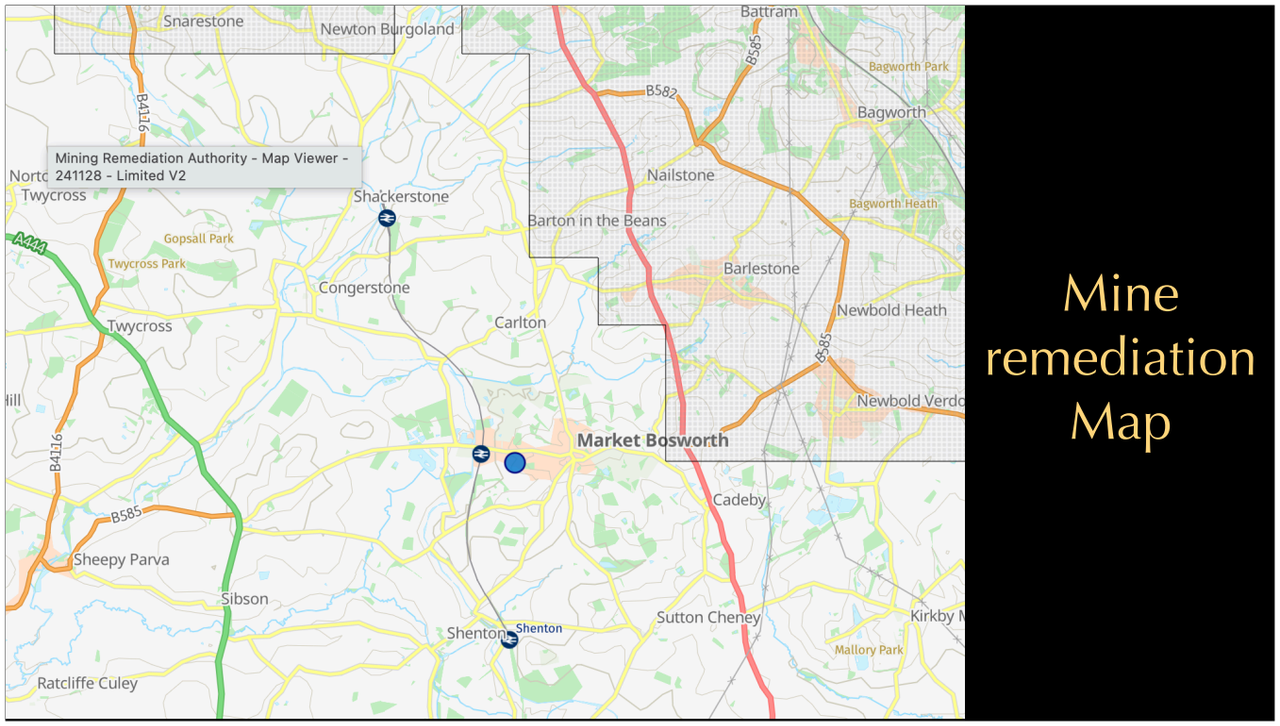
The Northern Mines Research Society does not indicate any coal in the immediate vicinity.

Ther nearest coal is below the road to Newbold Verdon and an isolated mine at Grange Lane, between Carlton and Congerstone which operated from 1856 to 1911

1000ft seems a little deep for this area, Snibston only reaching 850 ft, although Daw Mill is deeper at 2,430ft, but that's in another coalfield

On the 11th Baronet from Peter Loseby

John Colby November 2025



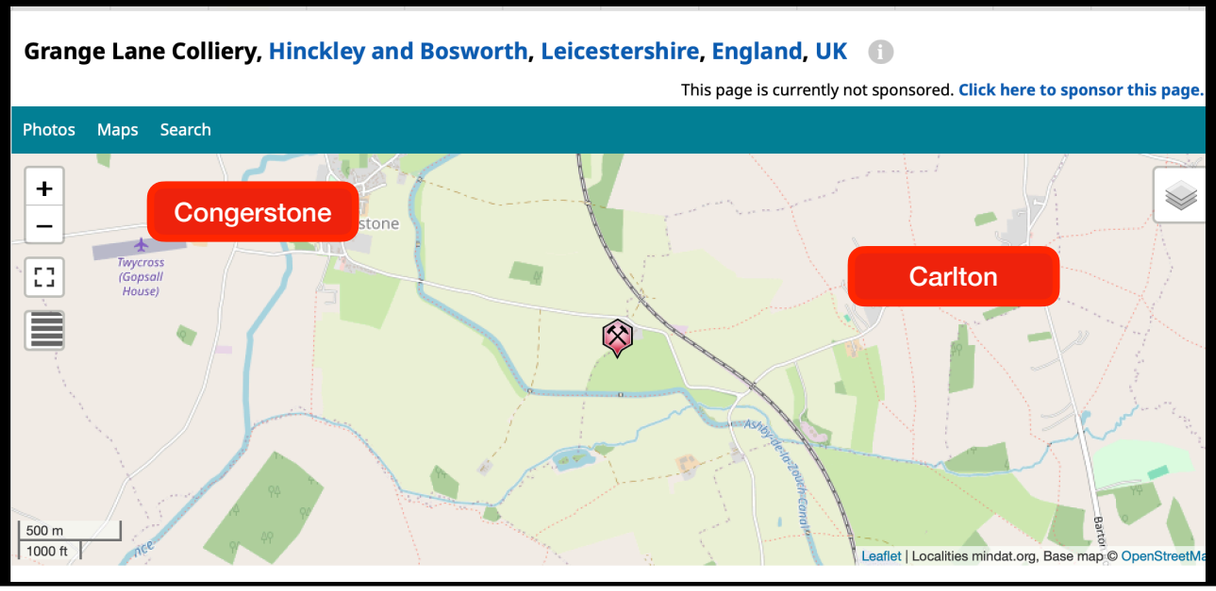
Source:

Mine remediation map viewer

https://datamine-cauk.hub.arcgis.com/

John Colby November 2025

Grange Lane, Congerstone 1856-1911



Orogenies are never tidy - they’re chaotic - and in forming anticlines some pockets of coal were left. This is one operational 1856-1911

Source:

Grange Lane https://www.mindat.org/loc-377818.html

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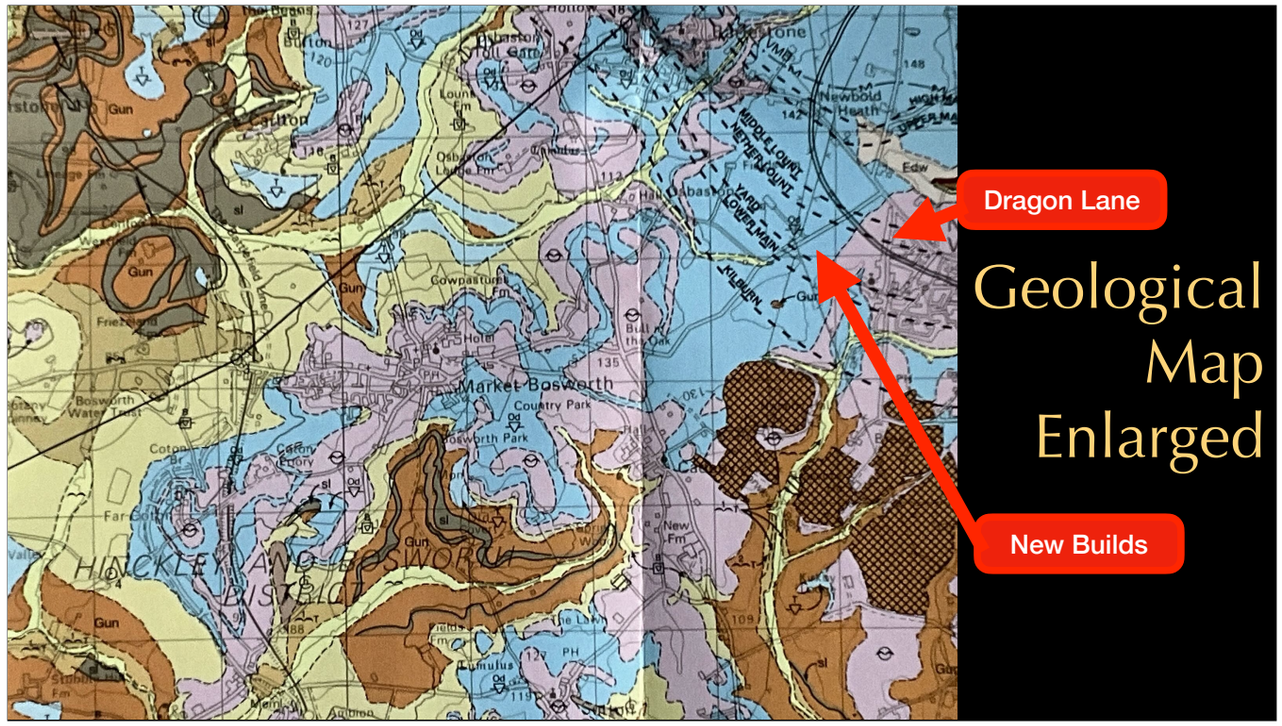


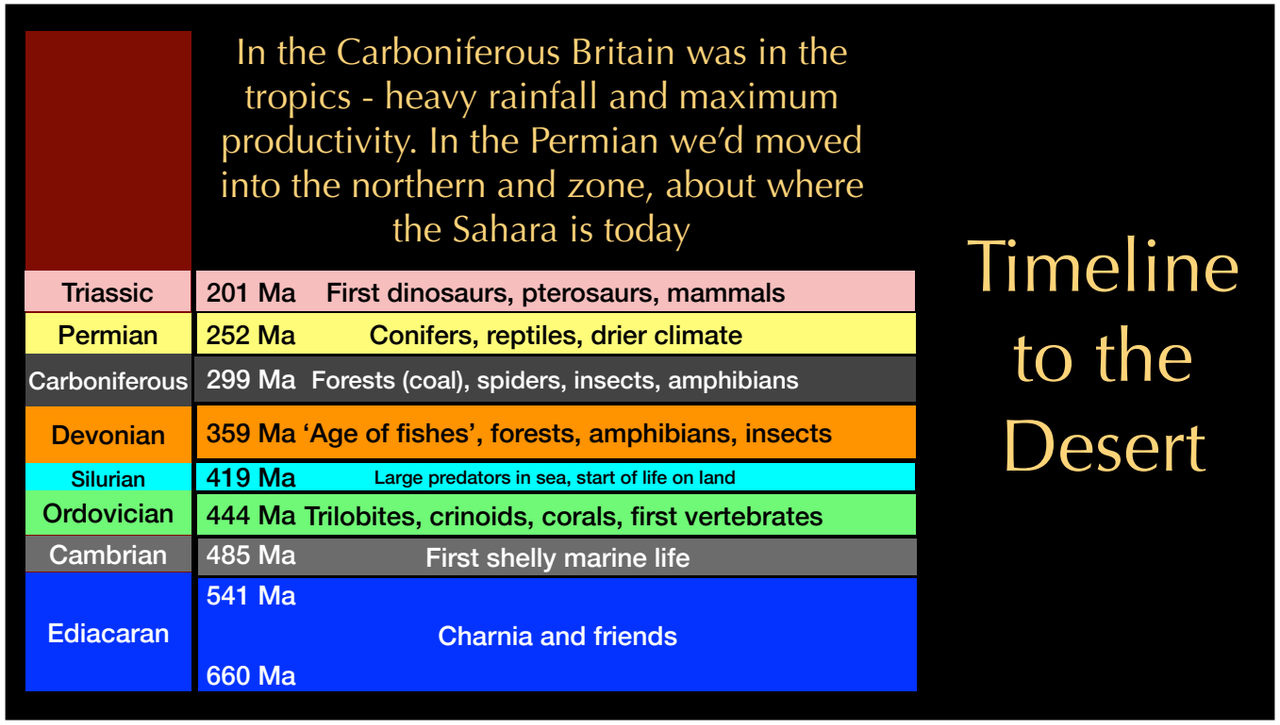
Closer to home we can see the Newbold Verdon coals with Dragon Lane and the new builds

John Colby November 2025

Instructions to Planet Earth

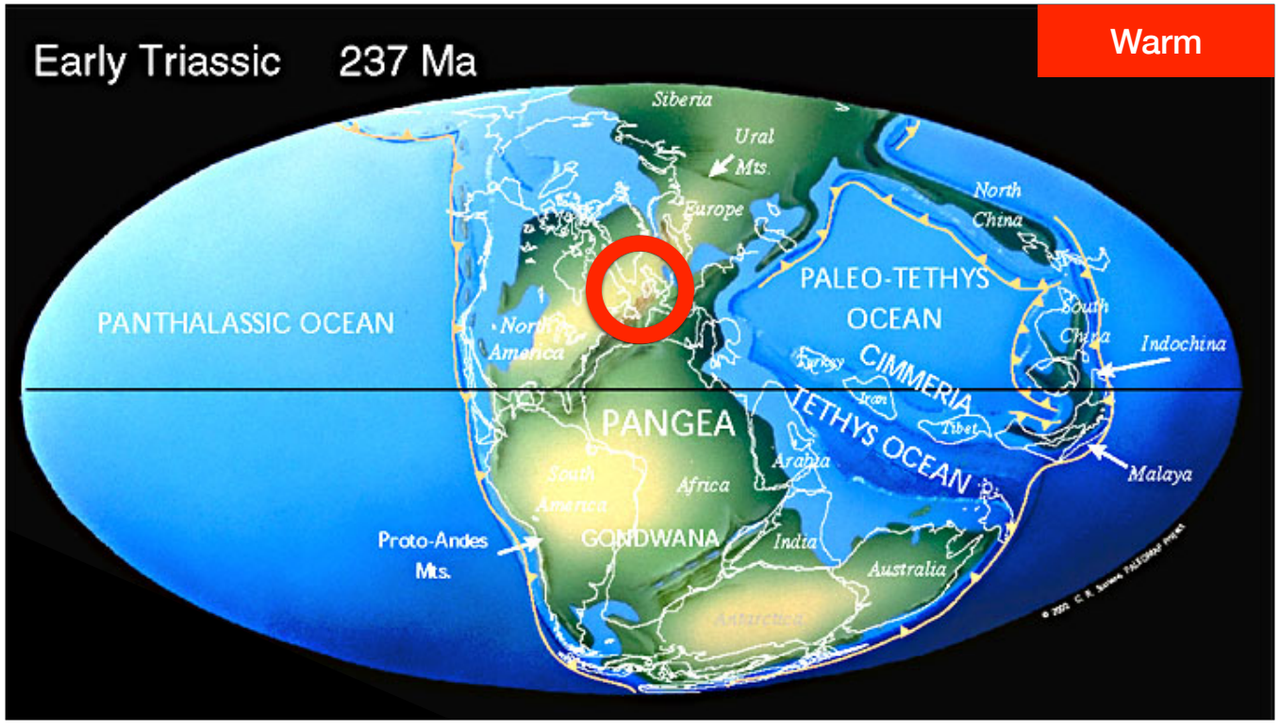
1. Close an ocean, build mountains	1. Bump
2. Move to the tropics, erode the mountains	2. Grind
3. Grow stuff, let it die in stagnant ponds	3. Grow
4. Create peat from the dead stuff	4. Pong
5. Bury it, squash it, do it again	5. Repeat
6. Close another ocean, build more mountains	6. Bump
7. Bend bits of it, crack it, erode it	7. Squeeze
8. Move it all to the arid zone	8. Shift
9. Fill the gap with desert sand residue	9. Hot
10. Let it mature	10. Time
11. Cool it a bit	11. Freeze
12. Allow advanced hominins to discover it	12. Dig

John Colby November 2025



Filiing the gap left by the erosion of the coals are desert sediments of the Permian and Triassic

John Colby November 2025



Britain had now moved into the norther arid zone, around the position of the Sahara today

John Colby November 2025

Source:

http://www.scotese.com/earth.htm

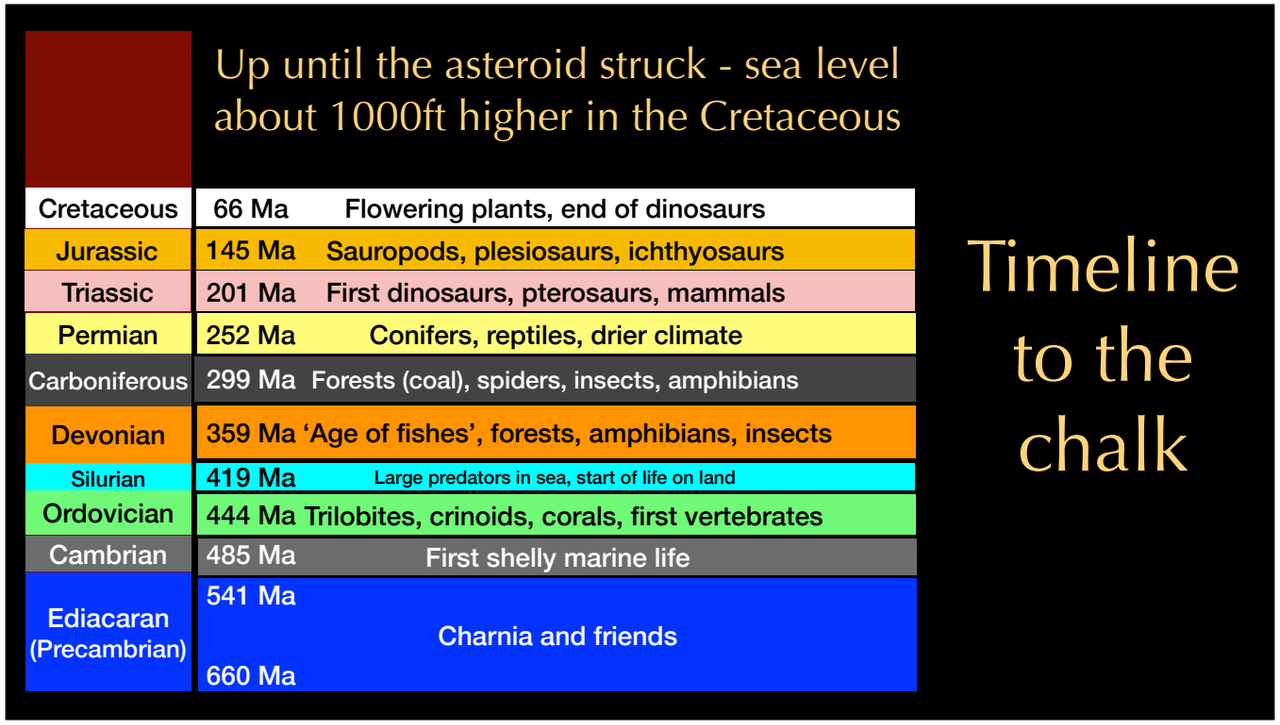
St Peter’s porch ha dessert sands - cross bedding and relict dune evidence

Dune systems built then eroded - flow left to right

John Colby November 2025

Or more complex

John Colby November 2025



Triassic - dinosaurs around in Rutland - Cetiosaurus in Leicester museum, 168 million years old

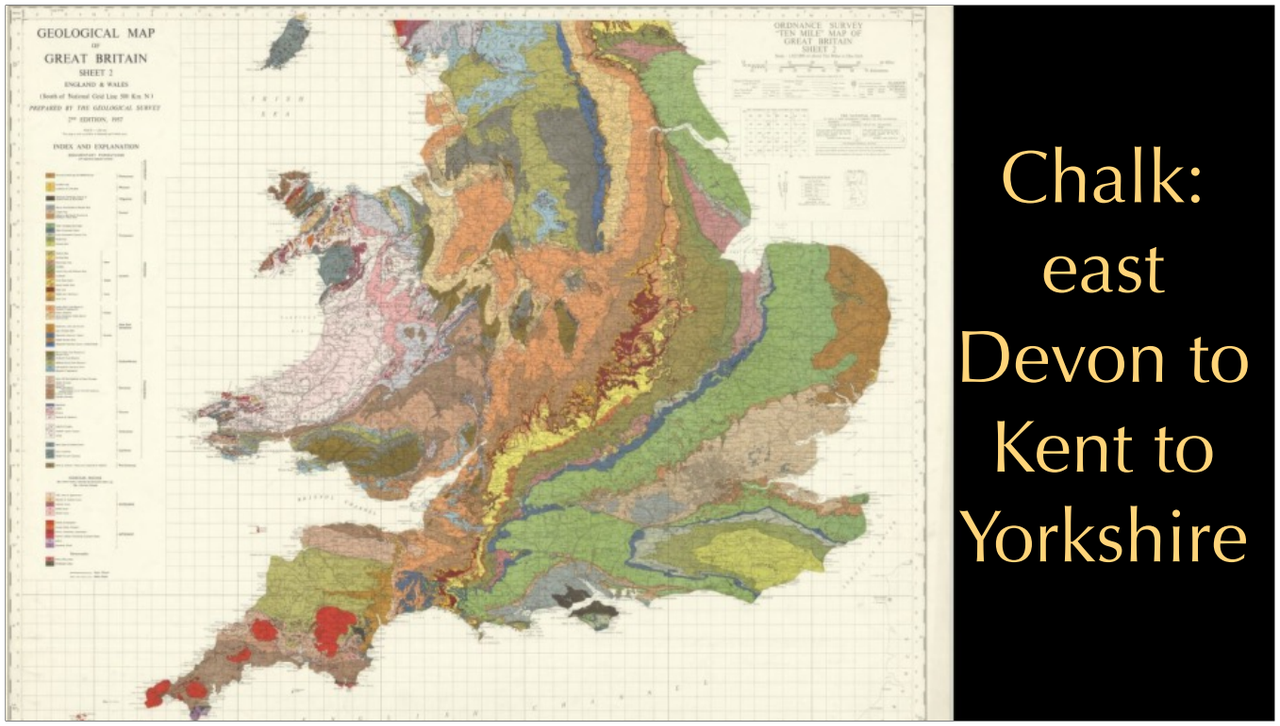
Sea level in the cretaceous was about 1,000 feet higher - major deposition of chalk, a very pure carbonate

Then the great asteroid impact

Source

https://www.leicestermuseums.org/media/cmhmoasc/dinosaur-gallery-activity-sheet.pdf

John Colby November 2025



Chalk: east Devon to Kent to Yorkshire

Chalk east Devon to Kent to Yorkshire in green

The folding in southern England was due to the Alpine Orogeny, mainly 35 to 5 million years ago

John Colby November 2025

Holocene	Now	Neolithic to present
Pleistocene	11,800yr	Glaciations – human evolution
Pliocene	2.9 Ma	Sabre-toothed cats, sloths, early hominins
Miocene	5.3 Ma	Grassland spread, apes, toothed whales
Oligocene	23 Ma	Global cooling, deer, horses, predators
Eocene	33.9 Ma	Bats, whales, elephants, early horses
Palaeocene	56 Ma	Mammals increase, lush forests
Cretaceous	66 Ma	Flowering plants, end of dinosaurs
Jurassic	145 Ma	Sauropods, plesiosaurs, ichthyosaurs
Triassic	201 Ma	First dinosaurs, pterosaurs, mammals
Permian	252 Ma	Conifers, reptiles, drier climate
Carboniferous	299 Ma	Forests (coal), spiders, insects, amphibians
Devonian	359 Ma	‘Age of fishes’, forests, amphibians, insects
Silurian	419 Ma	Large predators in sea, start of life on land
Ordovician	444 Ma	Trilobites, crinoids, corals, first vertebrates
Cambrian	485 Ma	First shelly marine life

Timeline to the present

The latest classifications of geological time lead up to our next covsideration of the Pleistocene ice ages.

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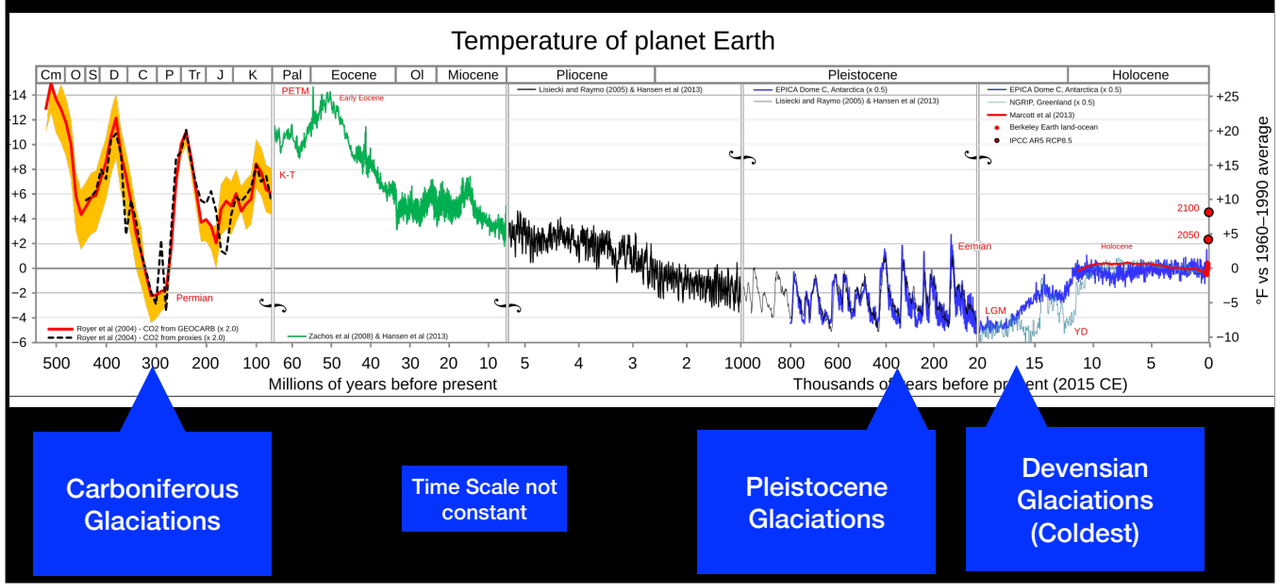
Climate Timeline in the Ice Ages



This is the temperature profile of Earth, marking the glaciation mentioned previously, and now we're going to be looking in more detail at the last Ice Age

Source:

Temp Chart https://upload.wikimedia.org/wikipedia/commons/thumb/5/5f/All_palaeotemps.svg/2560px-All_palaeotemps.svg.png

John Colby November 2025

Pleistocene and Holocene			
Holocene (Flandrian)	Temperate	Palaeolithic to present day	11,800 BP
Loch Lomond Stadial	Cold	Britain largely unpopulated	12,650 BP
Bølling–Allerød	Temperate	Creswellian late Palaeolithic (Bradgate Park)	14,700 BP
Dimlington Stadial	Glacial	No humans in Britain	24,000 BP
Middle Devensian	Temperate	Early modern humans (or Neanderthals?)	59,000 BP
Middle Devensian	Periglacial	Humans present sporadically	71,000 BP
Early Devensian	Warmer	Possible Neanderthals	116,000 BP
Ipswichian	Warmer	No human occupation	126,000 BP
Late Wolstonian	Glacial	Lake Harrison at end of period	195,000 BP
Middle Wolstonian	Warmer	Some human activity	240,000 BP
Middle Wolstonian	Periglacial	Humans probably absent	297,000 BP
Early Wolstonian	Warmer	Possible human activity	330,000 BP
Early Wolstonian	Periglacial	Humans probably absent	362,000 BP
Hoxnian	Warmer	Early humans present	423,000 BP
Anglian	Glacial	1000m thick ice humans absent	480,000 BP
Cromerian	Warmer	Early humans present	860,000 BP
Beestonian	Glacial	Sub-arctic vegetation	c. 1.6 million BP
Pastonian	Warmer	Early hominins, hyenas, sabre-toothed cats,	Not precisely defined
Baventian	Glacial	Probably mostly unpopulated	c.2.427 million BP
Bramertonian	Temperate	Mixed oak forest	2.58 million BP

We're talking about the last 2 1/2 million years they've been successive warmer and colder periods when you get the colder period ice accumulates when you get the warmer period ice melts and that's the succession we can diagnose from the deposits left by that process.

Throughout this time, flora and fauna have changed according to the climate, and it is during this period that we see human development from early hominins to Homo sapiens. What we've got is a picture of the landscape to which humans adapted.

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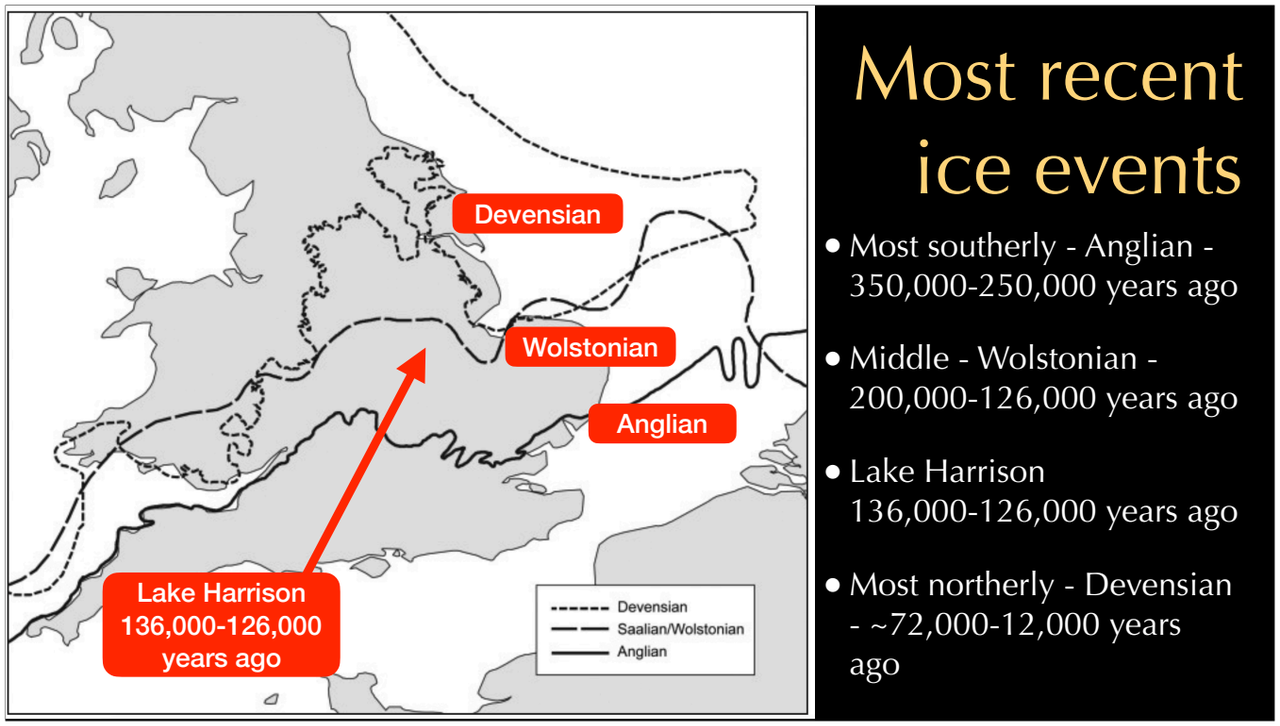

Most recent ice events

- Most southerly - Anglian - 350,000-250,000 years ago
- Middle - Wolstonian - 200,000-126,000 years ago
- Lake Harrison 136,000-126,000 years ago
- Most northerly - Devensian - ~72,000-12,000 years ago

Because evidence of prior glaciations get obscured by later events, we only really have evidence of the last three major stadials.

The Anglian was the most southerly that was followed by a warmer period. There is evidence in north Devon of Neo-glacial meltwater valleys, Valley of the Rocks and at Hartland

The Wolstonian was next again followed by the Ipswichian warmer period. at the end of the Wolstonian we had the formation of meltwater Lake Harrison

Finally the deepest glaciation with the Devensian and that is is what we are mostly seeing in the north as evidence of the landscape as has been traditionally taught by geographers

Source:

https://www.emgs.org.uk/uploads/1/4/9/1/149143154/mg20_3_2022_163_worsley_shottons_role_in_wolstonian___devensian_controversies_2.pdf

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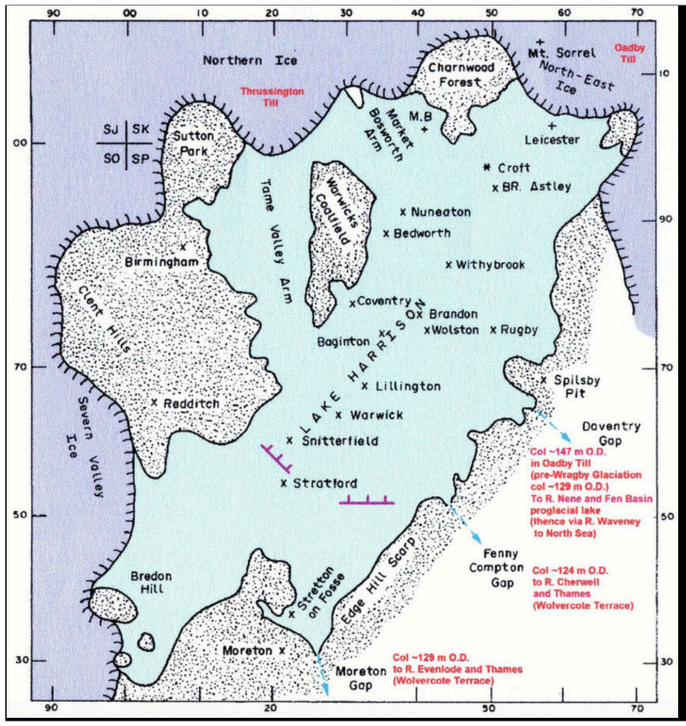


Meltwater

Glacial Lake Harrison or Lake Bosworth existed during the late stages of the Wolstonian Ice Age which ended about 126,000 years ago. It is estimated to have been in existence for about 10,000 years, covering a large area from Bredon Hill to Leicester.

Forth years ago Fred Shotton proposed that a meltwater lake had covered much of the Midlands from about 136,0o0 to 126,000 years ago and called it Lake Harrison. Since then the extent of this lake has been questioned modified, and changed name to Lake Bosworth.

It's been changed in area but the evidence for such a lake however big it is still compelling.

What we have is a natural occurrence of seasonal melting of an ice sheet which lay to the north, west and east
The seasonal melt produced violent streams causing erosion of rock deposition of sediments all in a quite chaotic manner if you think of the period from about March to June each year April to July each year that's when most of the melting occurred.

It caused erosion of the land and formation of evidence that is both fluvial and lacustrine.

We have sands, clays, pebbles, cobbles, all rounded, evidence of the environment at the time of deposition, of different flow pastes, of different water velocities and we are seeing an environment and landscape shaped by this glacial event. It was not obscured by later glacial events.

Source:

https://www.researchgate.net/profile/P-Worsley/publication/365841495/figure/fig7/AS:11431281103604106@1669741600545/Shottons-Glacial-Lake-Harrison-at-its-maximum-extent-and-the-controlling-thresholds.jpg

https://www.emgs.org.uk/uploads/1/4/9/1/149143154/mg11_3_1988_145_harwood_was_there_a_glacial_lake_harrison_in_the_south_midlands_2.pdf

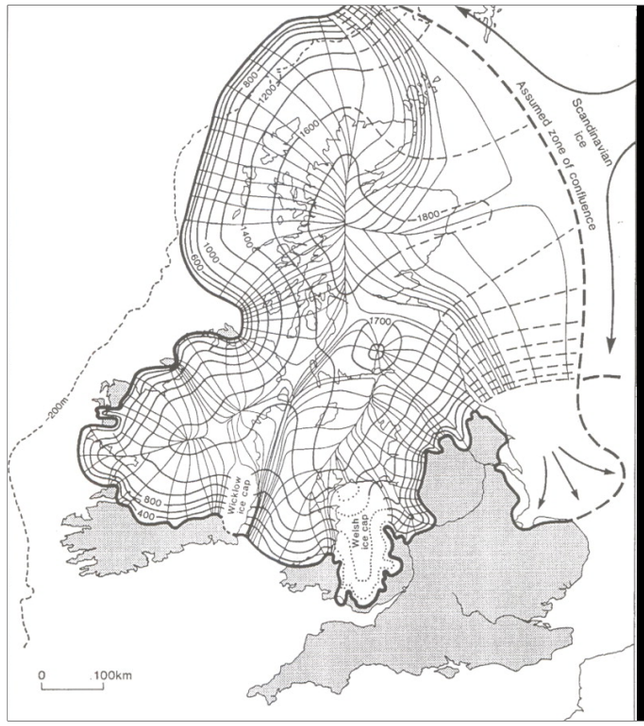
John Colby November 2025

Imagine this taken looking north east from above St Peters, to be covered by water

John Colby November 2025

Also this, looking west from Cadeby

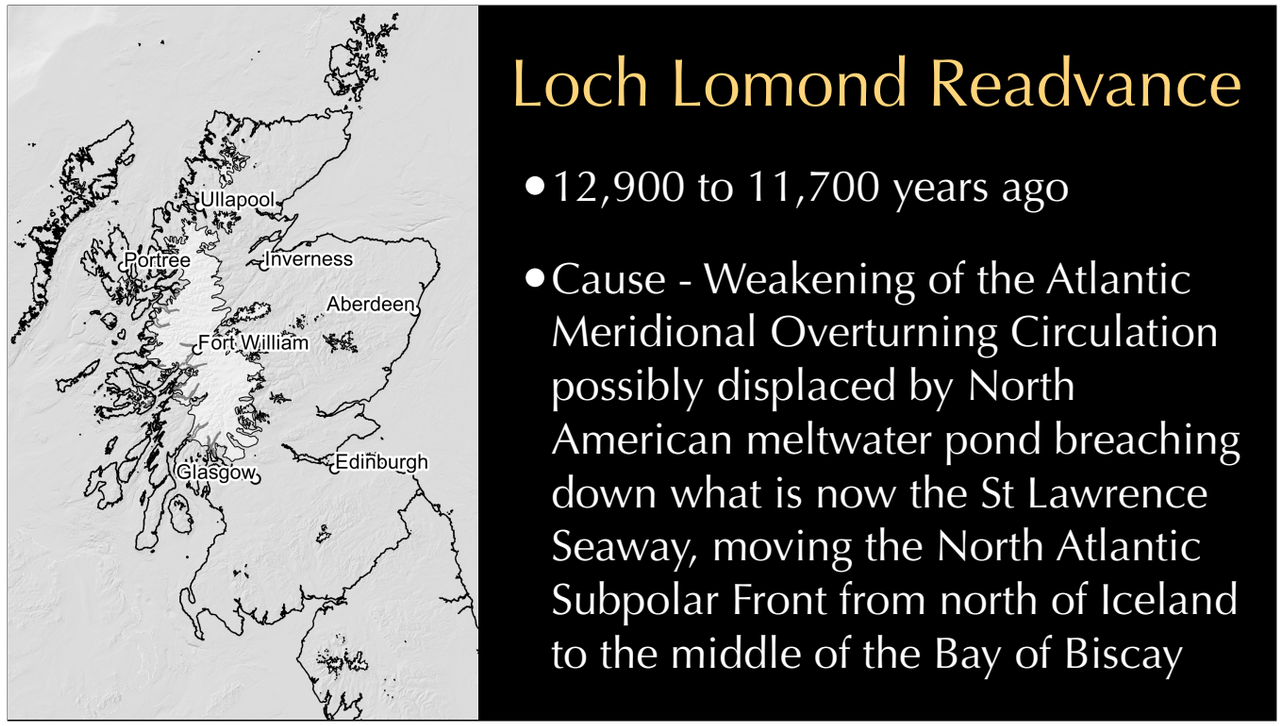
John Colby November 2025



Maximum Ice extent during the Devensian

Later then the Wolstonian glaciation which produced the lake was the Devensian, further north although colder.

John Colby November 2025



Fid finally, caused by the weakening of the Atlantic Meridional Overturning Circulation possibly displaced by North American meltwater pond breaching down what is now the St Lawrence Seaway, moving the North Atlantic Subpolar Front from north of Iceland to the middle of the Bay of Biscay, plunging Britain into the cold again.

John Colby November 2025

Slightly before this there was the Creswellian, late Palaeolithic activity evidenced at Creswell Crags and in Bradgate Park where there is evidence of dwelling and hunting

Human activity in our landscape ceased at the onset of the cold.

Source:

https://www.antarcticglaciers.org/glacial-geology/british-irish-ice-sheet/younger-dryas-loch-lomond-stadial/the-loch-lomond-stadial/

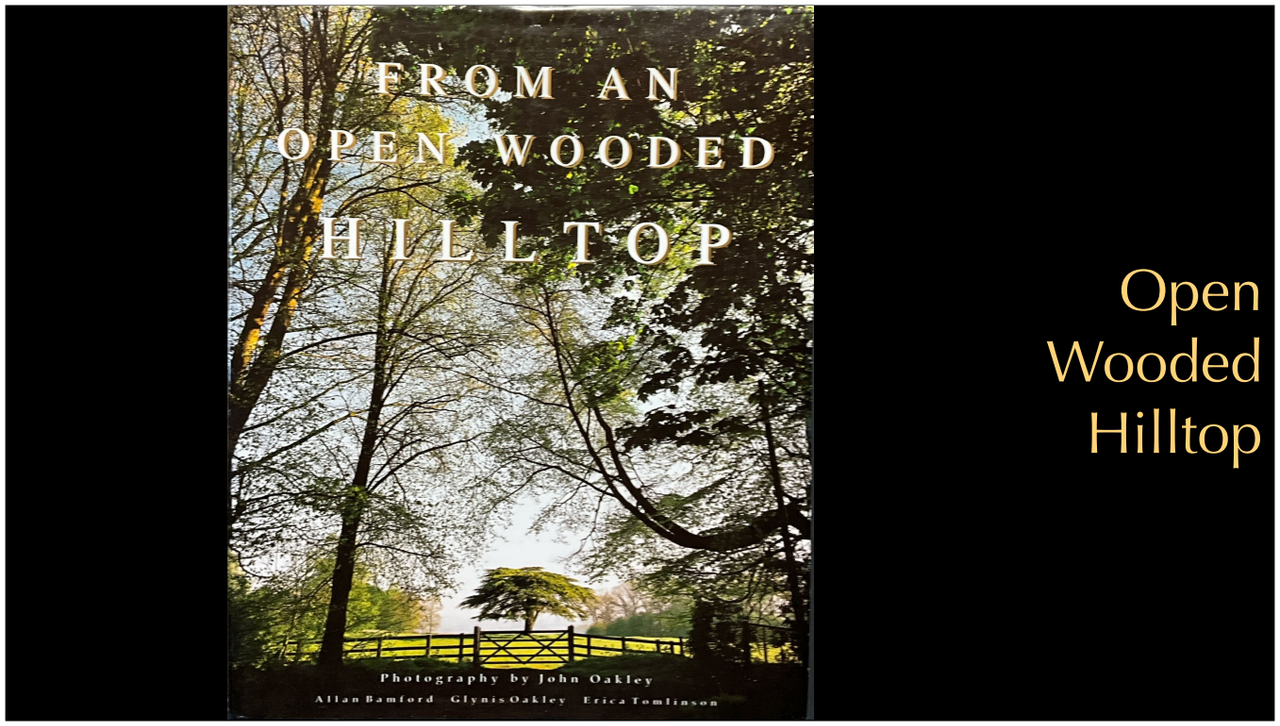
Sea level and land during the Loch Lomond Stadial and Holocene

During the Loch Lomond Stadial sea level fell, and its rise shows, among other things, why there are no snakes in Ireland.

As sea level rose because of the melting of ice the Irish Sea, being about 100 m deep, filled up first by about 10,000 years ago. The English Channel, abut 35m deep, filled about 8,000 years ago.

It was too cold for snakes in England 10,00 years ago, so they didn’t get to Ireland, but it was warnm enough for them to get to England from continental Europe 8,000 years ago, so we have snakes, and Ireland doesn’t, nothing to do with St Patrick.

John Colby November 2025



Open
Wooded
Hilltop

In Market Bosworth we’re in a hill. Everywhere you go from Bosworth, you go down.

John Colby November 2025

Market Bosworth Park excavation

And everywhere you dig up the pebbles are rounded. That's evidence of them being in some sort of flowing water to make them rounded. This is an excavation from the park where John Oakley has been planting trees and none of the pebbles are angular. That's the important evidence. That's the evidence you can see.

John Colby November 2025

Water and rounding - Crosby Beach

If you wanna know how long it takes to round a pebble, have a look at this which is rubble from the Liverpool Blitz dumped on Crosby Beach. In a period of 80 years the corners have been rounded off and for the pebbles which formed part of our soils they had 10,000 years to get rounded.

John Colby November 2025

We can see the evidence from deep in the soil. This is from the graveyard at Seckington where I happen to chance on a newly filled grave a couple of summers ago all the pebbles are rounded.

This is particularly good evidence because a graveyard adjacent to a church would not have been disturbed since the church was built and we were talking 700 years so anything brought up has got to have been there since the soil was deposited in the time of Lake Harrison.

John Colby November 2025

Market Bosworth Park wildlife pond

The lake also had periods of calm water areas of calm water and these deposited clays which are composed of much finer material than pebbles or sands. This is from the wildlife ponds dug in Market Bosworth Park showing a relatively thin soil cover, about a foot deep, overlying sticky clay.

John Colby November 2025

Market Bosworth Park Beau Pool spring

The park has springs this one is adjacent to Beau Pool is visible after rain. Rainwater falls on the sandy soil drains through it until it meets the impermeable clay layer where it comes out as a spring.

There's a stream in the park feeding Beau Pool and there is allegedly a spring underneath the pool itself, which is the main source of water. We'll come to that later.

John Colby November 2025

Market Bosworth Park tree planting

When John Oakley was digging pits for his avenue of trees in the Park towards Cadeby he kindly told me and I went up and photographed the holes. Uphill towards the car park, the clay is visible quite deep down these holes being two or three feet deep. It was wet so they started filling with water.

John Colby November 2025

Market Bosworth Park tree planting

As you go slightly downhill towards Cadeby it’s proof that the water in the sand flows downhill. There was more water and this was in January when it was quite wet it shows how the clay is preventing water seeping lower than the sand.

John Colby November 2025

In other evidence, people used local cobbles set in cement outside the windows of houses to prevent people standing and looking in. All are rounded. This is Park Street.

John Colby November 2025

So is this.

John Colby November 2025

And this is in Market Place.

John Colby November 2025

Market Place

The absence of anything angular and as the source of these pebbles were local says that lacustrine and fluvial deposition environments predominated.

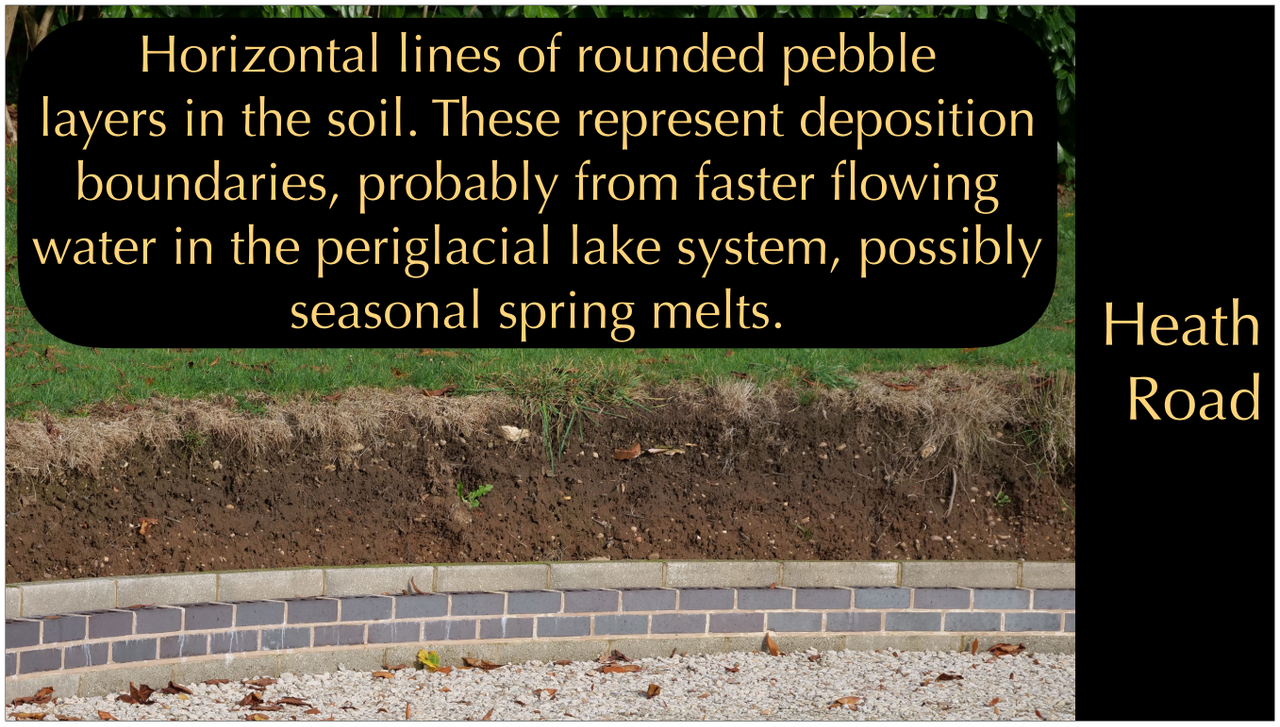
John Colby November 2025

And then we get bricks. There were two brick yards I can find in the vicinity, one near the station and one at Wellsborough. It wasn't just clay that got incorporated into bricks, rounded pebbles did as well. This is from the wall just outside rose and radish.

John Colby November 2025

And this is from the wall of the 18th century build in Park Street where pebbles were incorporated into bricks prior to firing.

John Colby November 2025



At the top end of Heath Road, horizontal lines of rounded pebble layers in the soil. These are below plough depth and represent deposition boundaries, probably from faster flowing water in the periglacial lake system, possibly seasonal spring melts.

John Colby November 2025

Seep showing clay/sand junction Heath Road near play area

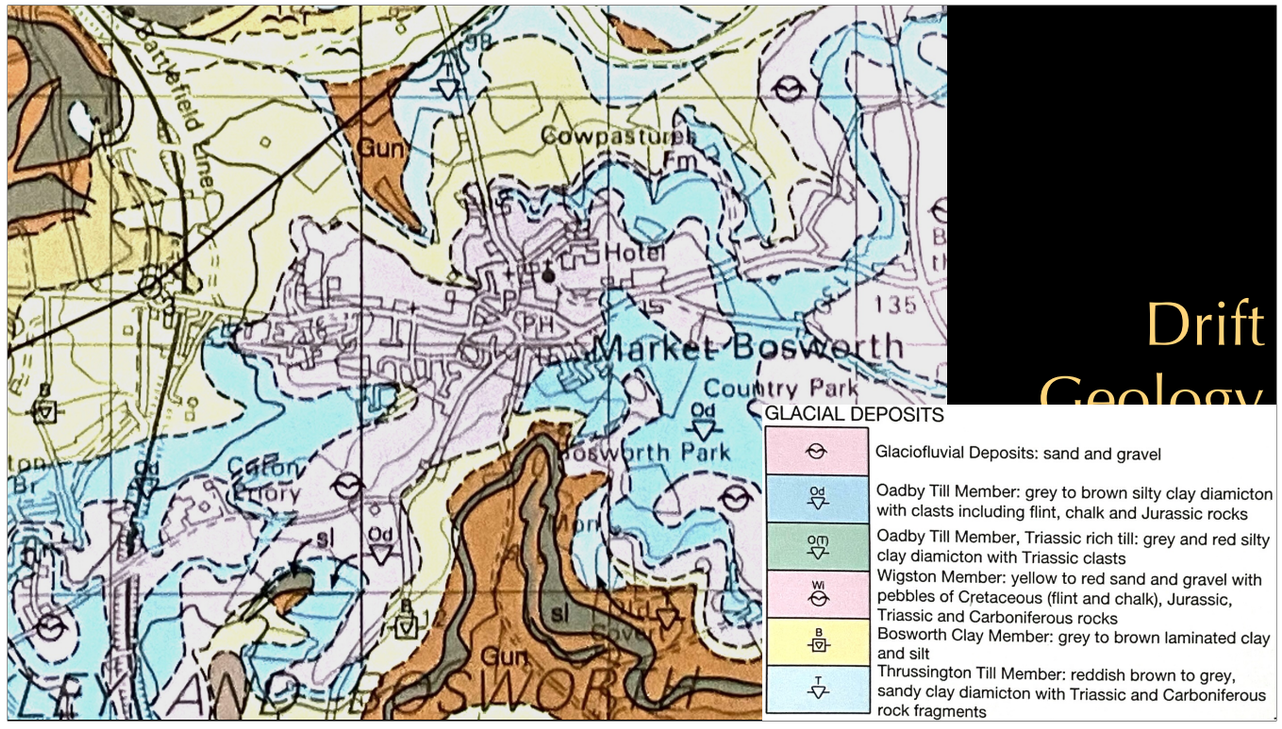
And near the park in Heath Road, there is a spring that appears on the pavement when it's been raining. There are other pavement seats around Bosworth but it hasn't been raining enough for them to be visible at the moment. Yes I know it's been wet but that's still not enough rain to soak the sand above the clay.

John Colby November 2025

Pebbled Pavements

Historically, there was more exploitation of cobbles as these formed the pavements prior to tarmacification of everything. The right hand photo appeared in last month’s talk.

John Colby November 2025



Drift Geology

If we have a look at a close-up of the geological map the majority of Bosworth sits on the pink sand and gravel. The park area is a brown silky clay. That's the top of the hill further to the West. We get more clay and done by the station, the pale yellow representing the Bosworth Clay Member. This has economic importance.

Economic Importance - Cadeby

If we have a look at the economic importance of what I've been saying, we need to go to Cadeby where the former Field we used to hold the Market boss with steam engine rally and is now a concrete works, Cadeby Quarry digs gravels, cobbles, sands and sells them and makes them into other products.

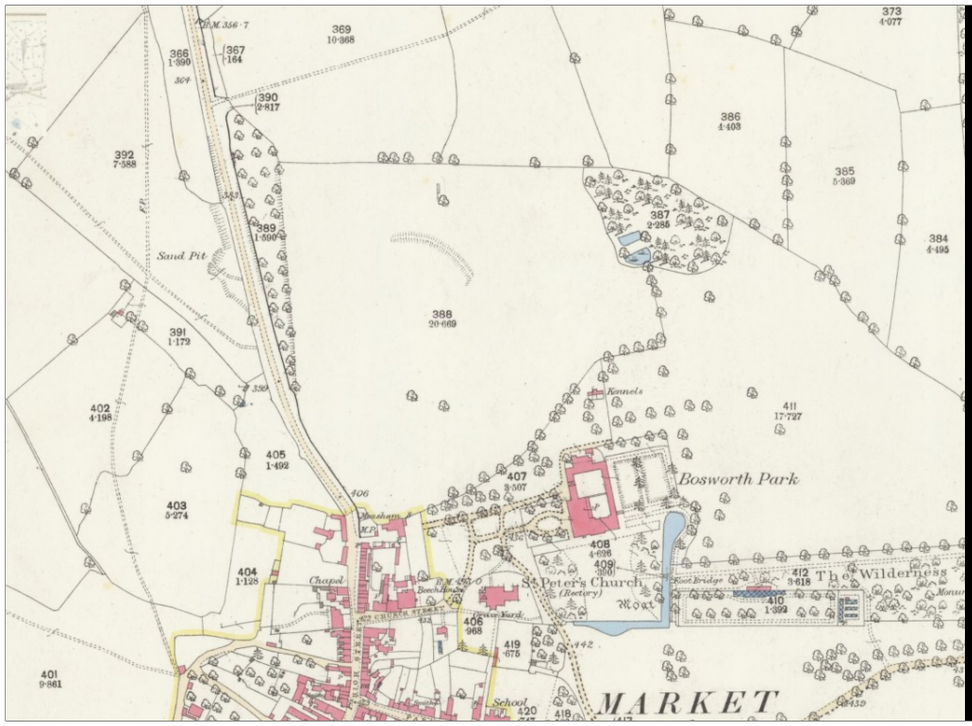
Economic Importance - Brick Yard 1886

By Market Bosworth station where there were woods but his now the new housing development there was a brickworks maybe where the bricks to build Bosworth came from. This is from the 1886 Ordnance Survey map.

Source:

https://maps.nls.uk/view/114593745

John Colby November 2025



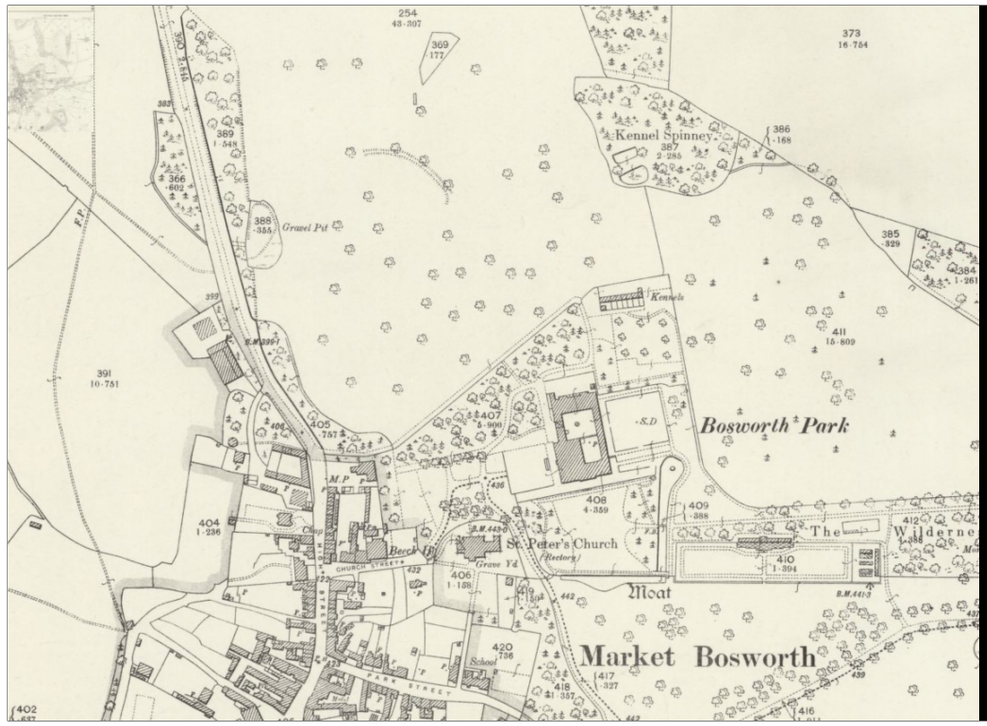
Economic Importance - Sand Pit 1886

Also from the 1886 map we have a sandpit near what is now Harcourt Spinney, the Saint Anne's Hill of Peter Foss' history of Market Bosworth.

Source:

https://maps.nls.uk/view/114593751

John Colby November 2025



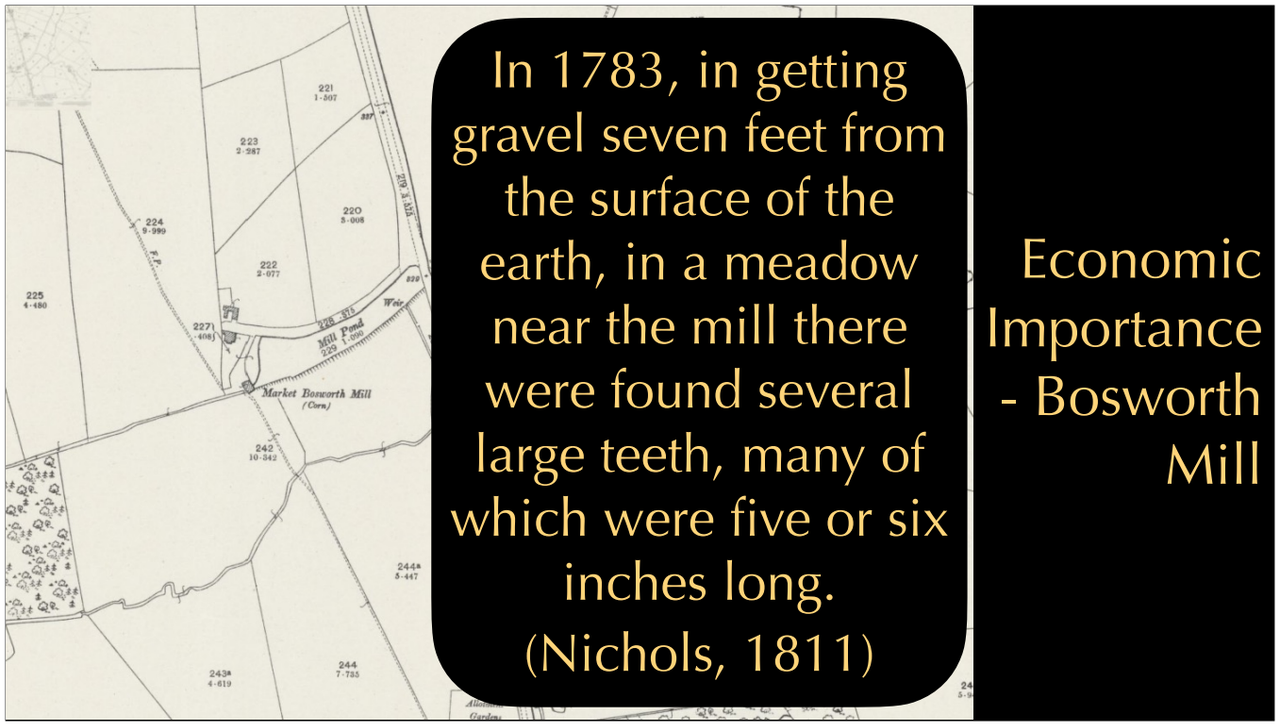
Economic Importance - Gravel Pit 1903

From the 1903 map the sandpit is now populated with trees but there is a gravel pit on the opposite side of the road

Source:

https://maps.nls.uk/view/114593754

John Colby November 2025



And although it is not mentioned on any maps in the history of Leicestershire, John Nichols in 1811 said that in a gravel pit near Bosworth Mill a number of large teeth were found.

In the Spring of 2000, archaeologists investigating Medieval village remains in the Rutland village of Glaston made an unexpected and remarkable discovery of much earlier artefacts from approximately 40,000 years ago. The rarely found evidence from the Early Upper Palaeolithic period consisted of worked flint tools, including a leaf-point spear head, left behind by early humans using the site as temporary hunting camp, and remains of a den occupied by spotted hyena. The landscape of this time would have been very different, containing a range of wildlife that is long-since extinct, including woolly mammoths, woolly rhinoceros and wolverines.

Big beasties with bog teeth were around during the Ice Age. Nichols does not give any more identification evidence, but we could think sabre tooth tigers or similar.

Sources:

https://maps.nls.uk/view/114593733

Nicholls, J (1811), History and Antiquities of the County of Leicester, Volume IV, part II, Spakenhoe

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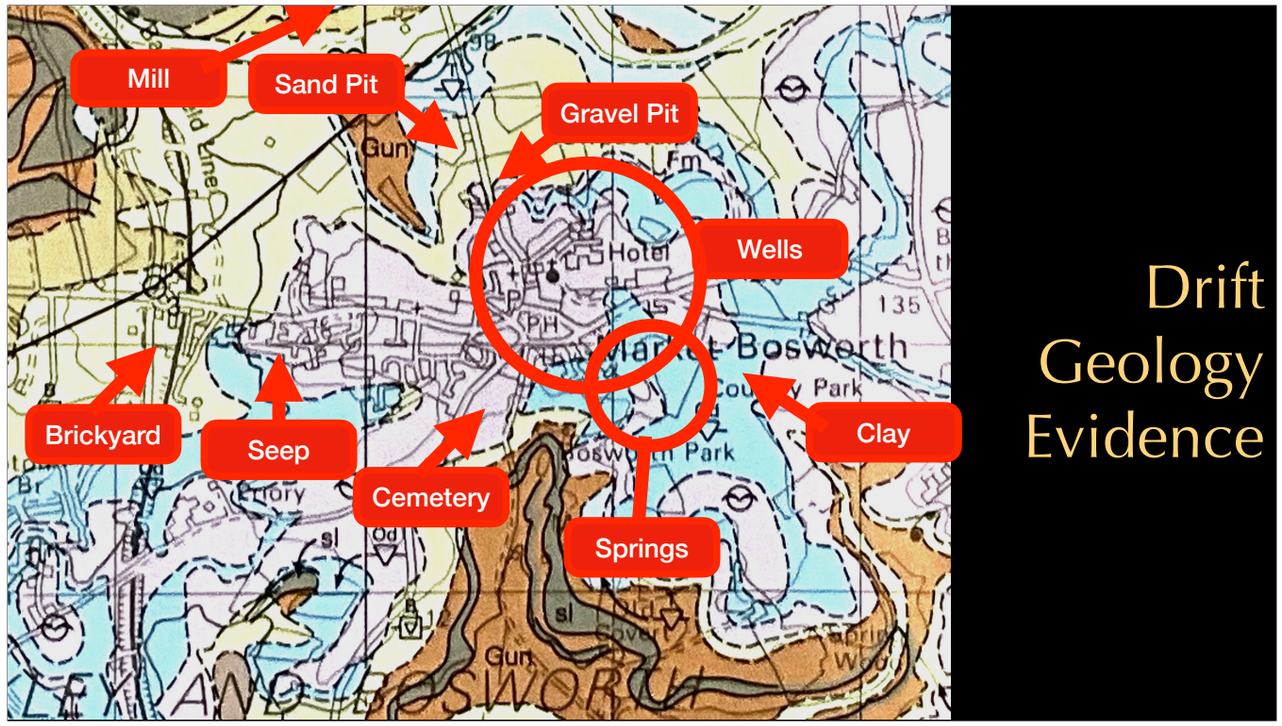

Let's just have a look at these locations against the geological map

The Brickyard is right on the Bosworth Clay.

The sandpit along Barton Road at Harcourt Spinney is on what is declared as sand

The gravel pit is at the junction of the sand ,the light yellow, and gravel, the pink, and the sand

The seep is at the junction of the sand, the pink, and the clay coloured on the map as blue

The yellow clay in the park coloured blue.

Former farmland where the new cemetery now is “would not take a furrow”

We're coming to the wells and the springs but they had to be located on the map for explanation

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- Rain falls onto the hill
- It seeps into the sand of the hill
- Gravity acts
- It stops going down when it hits impermeable clay and spreads sideways
- Wells were dug, pumps installed when technology permitted

Water

Water goes sideways as well as down, the pore pressure in the sand determining where it flows

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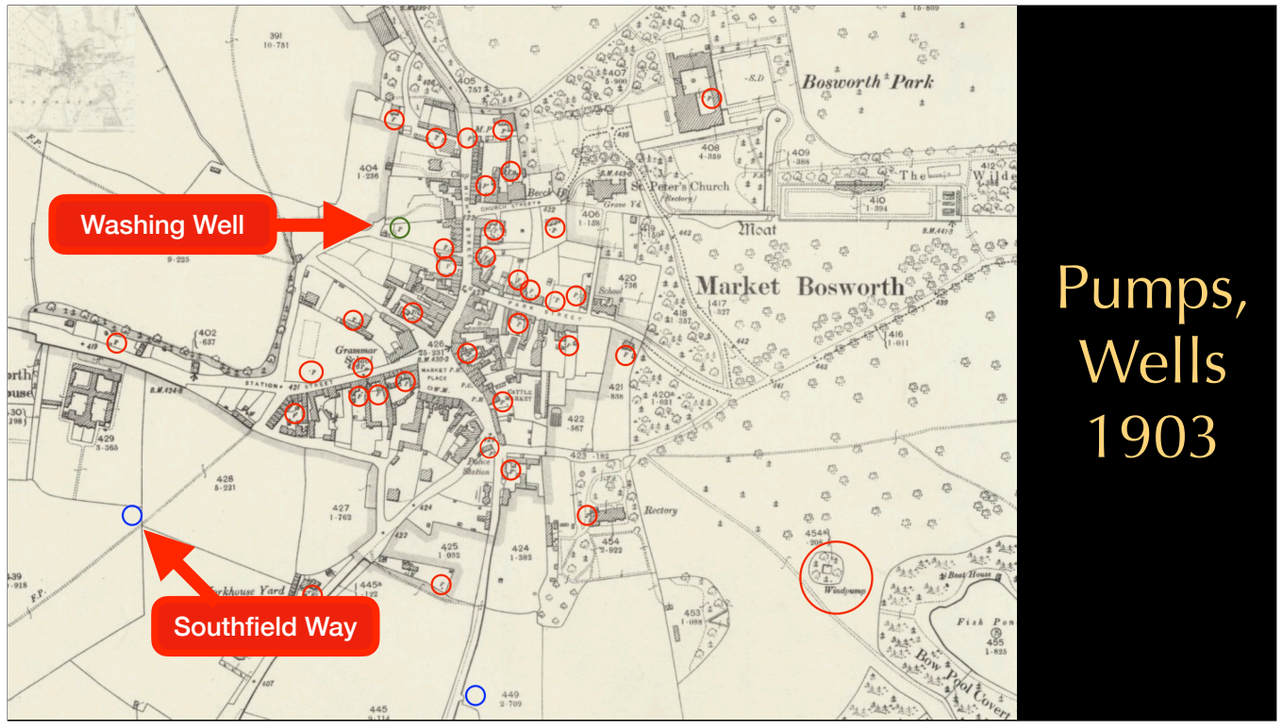

Pumps, Wells 1903

If I counted correctly, the 1903 map shows 35 pumps in the town now these exclude those which I know came up in kitchens and sculleries. From what I can find out they were all about 15 to 20 feet deep, which would have gone through the sand and sourced at the level of the clay.

There's also the washing well down Back Lane. This is at a low topographic point.

One well, not shown on the 1903 map, is on Southfield Way, it fills up when it rains. I have been told that a contractor offered to ind the water source and stop it. They'd have a job.

So what we have is the exploitation of the water falling on the hill, filtering through the sand and being caught at the impermeable clay layer. People exploited this by digging wells and chucking a pump on the top for convenience.

The sand would have been an excellent filter to purify the water for domestic use.

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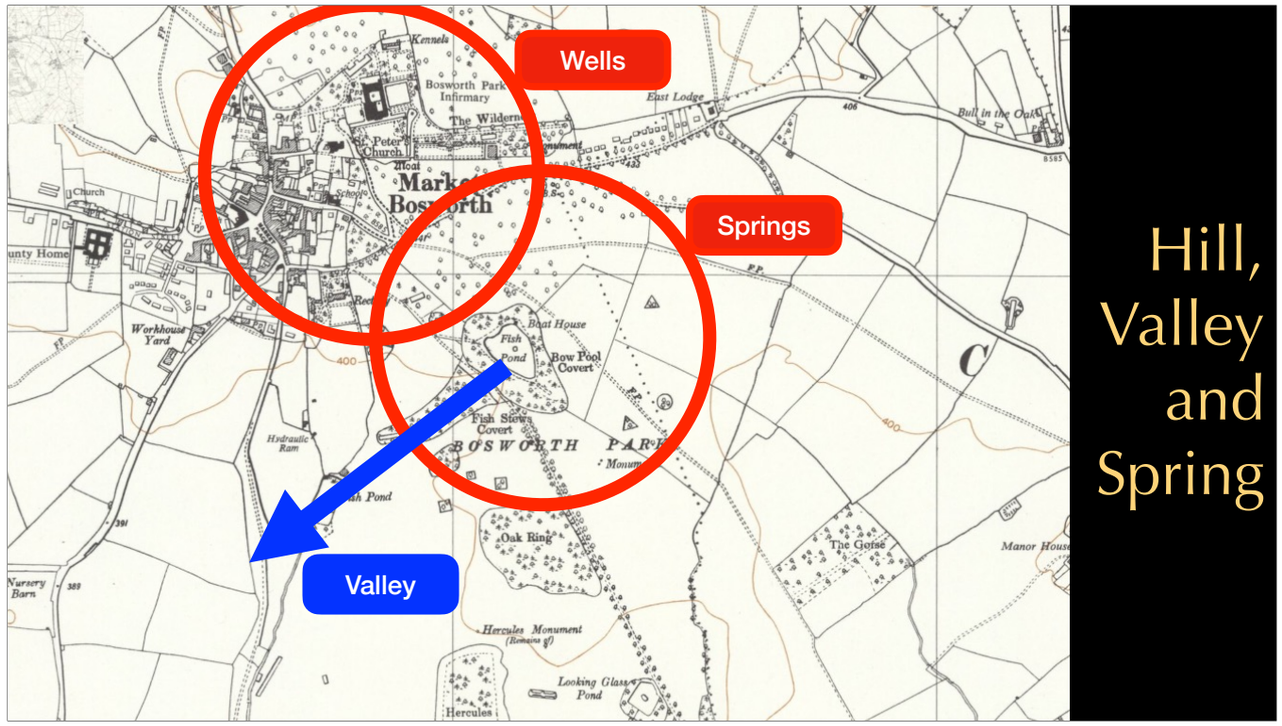

It is said that in times of drought the well on Sutton lane was the last one to go dry. This is in the vicinity of the hydraulic ram mentioned on the maps.

I know we come to Beau Pool and it's water source, mentioned by David Luther in his talk last year.

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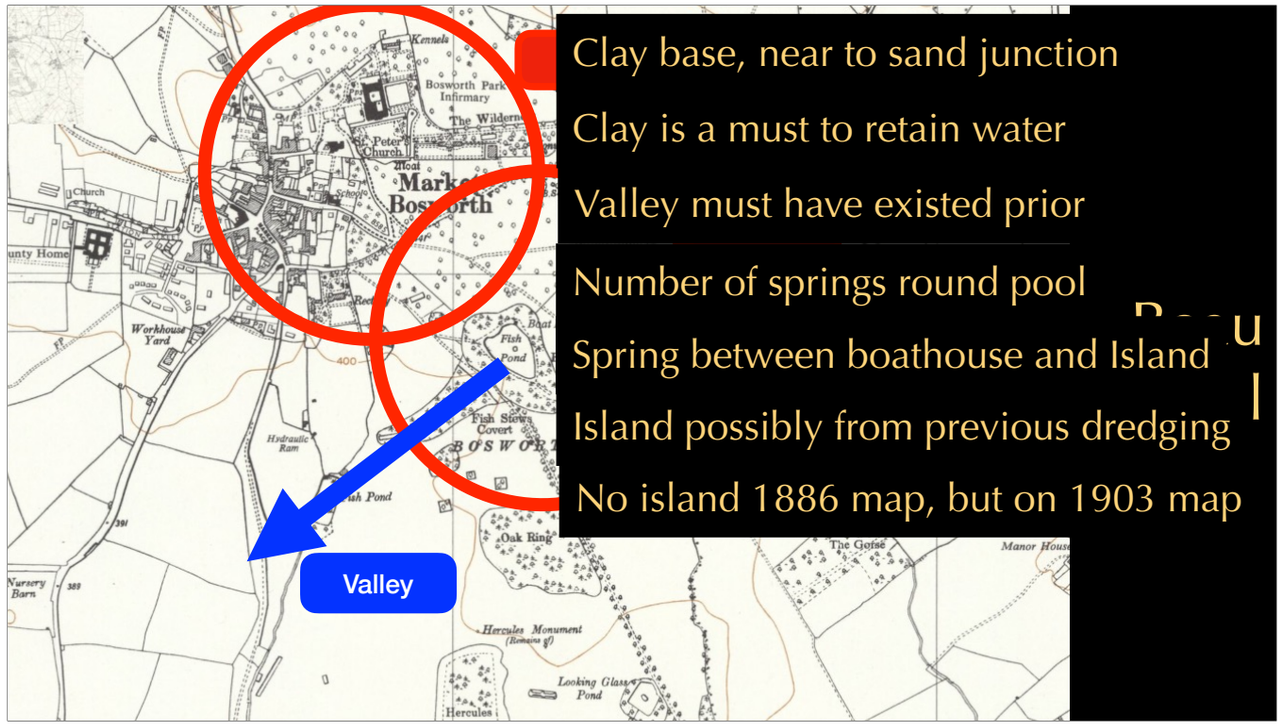
https://maps.nls.uk/view/189227547



Beau Pool would have been scraped out of the clay otherwise it would not retain the water.

The original pre-pool valley is still there and would have been the natural drainage channel. Very close to Beau Pool is the junction between sand and clay where the main spring would be coming from.

As we have seen, there are a number of springs around the pool, but I think the main spring is under the pool between the boathouse and the island. This is based on the observations from the topography of the valley and examine what is left of the previous deep park landscape.

Hopefully this gives a possible answer to the lecture a year ago.

The island itself is interesting. There isn't one shown on the 1886 map but there is one on the 1903 map.

Source:

https://maps.nls.uk/view/189227547

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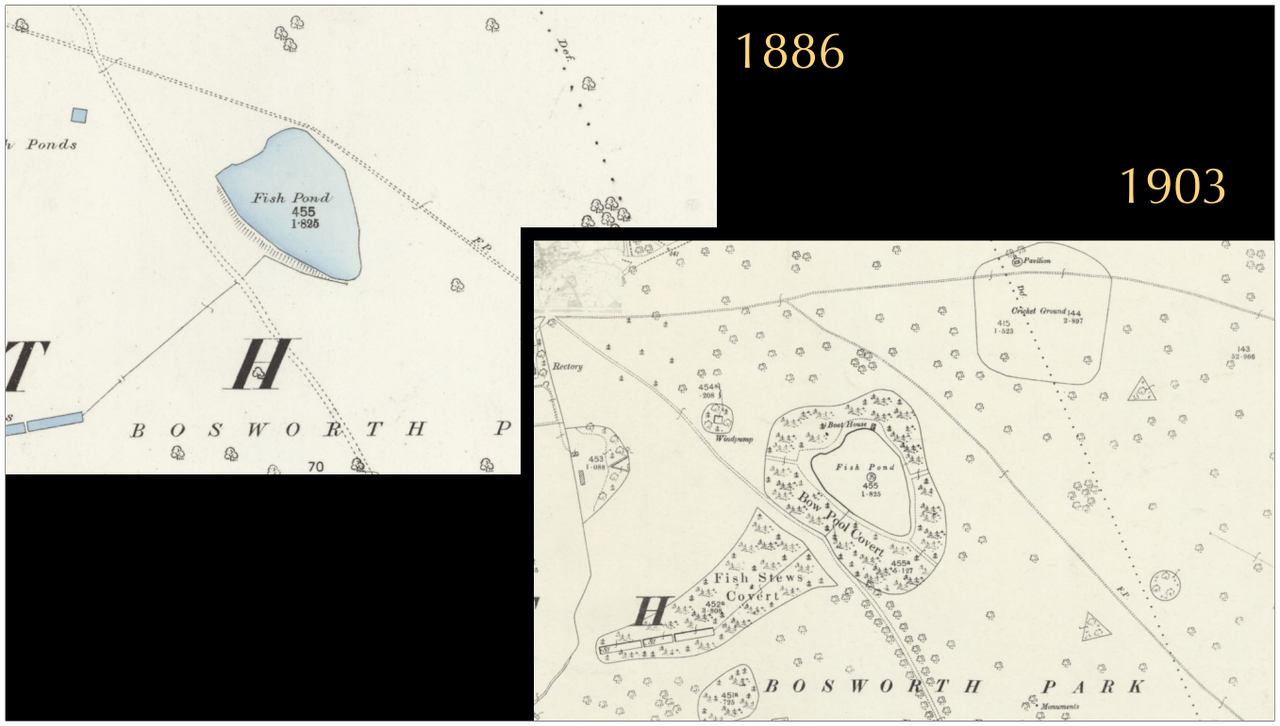

Judging by what happened, admittedly in an earlier time in carp ponds, islands were created to give nesting waterfowl protection from predators, especially foxes.

This wasn’t necessarily altruism, but protecting a food source.

As we have 17 years between these two maps, it is possible that the pool was dredged and the silt piled up to form the island. Where else would they put it?

If when the island is next visited, and of course that assumes a boat is available, then examination of the material creating that island may give credence to this theory, or not.

Source:

https://maps.nls.uk/view/189227547

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And finally the Golden Cockerel flying in autumn.

In summary, hopefully this has given an insight into some major geological events that have shaped our area with the evidence that anyone can see by walking around.

I must give my thanks to Peter Loseby, Nigel Palmer and John Oakley for their information and assistance with some background and facilities in making this presentation possible.

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