Geology sources

This needs to be simplified and various points clarified 30/6/2016 last amended 17/7/2016

Sources

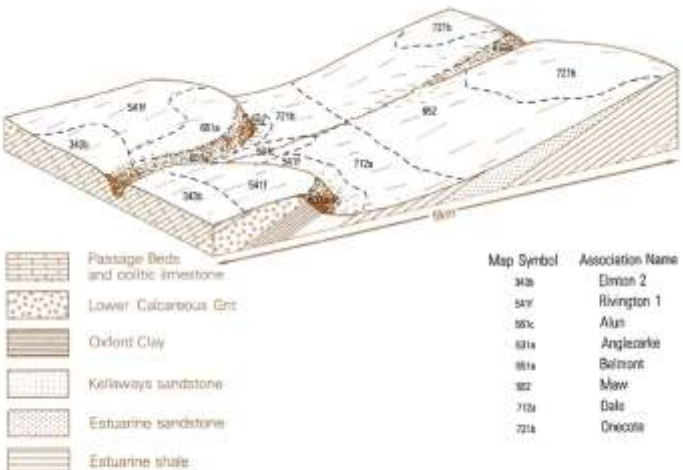
Gerry McDonnell Archaeometallurgy http://archmetals.org.uk/geology-and-geography.html
Whitby Jet Heritage centre http://www.whitbyjet.co.uk/about-jet/mining.html
Stanhope White The North York Moors 1979
The North York Moors Natonal Park Ian Carstairs 1967
Jet Mining in North East Yorkshire J S Owen 1975
Caves of the North York Moors John Dale & Carl Thomas
http://www.staithes-town.info/geology/physical-map.asp geologu diagram
https://www.landis.org.uk/services/soilsguide/mapunit.cfm?mu=63101 cutaway diagram
http://www.palass.org/meetings-events/annual-meeting/2014/annual-meeting-2014-field-guide-tropical-yorkshire
geology diagram
http://www.discoveringfossils.co.uk/how_britain_formed.htm for world maps
http://www.scotese.com/moreinfo10.htm world maps and onfo about Jurassic *see below*
http://www.bbc.co.uk/nature/history_of_the_earth/Cretaceous summary of geological periods *see below*
maps in my pictures/earth

Brief outline for Bygone Bilsdale Review

Jurassic rocks laid down - started 205m ago when the large single continent Pangea was starting to break up, the Tethys sea to the east was closing and the Atlantic ocean to the west was being formed
3 different environments, lower, middle and upper Jurassic – explain
Chalk laid down in our area *check*
Erosion under the sea - *check*
Land above sea – then contorted dome over centralmoorland so rocks in Bilsdale tilt slightly SE –this occurred when Africa hit Europe & alps formed *check this was in Eocene period*
Erosion, 3000 ft *how much was after emergence from sea*?
Ice age – overflow channels etc, eroded down into the lower Jurassic lias
Middle Jurassic sandstone forms the upper Vlley sides and n moor tops
Upper Jurassic limestones form the tabular hills at Newgate Banks
Recent changes by man

The underlying rocks of Bilsdale - the layers of the cake –
There's a reference to Jurassic strata "using old terminology" what's the new terminology
The following provisional list combines various sources and needs to be confirmed

Ampthill Clay & Kimmeridge Clay
Upper Jurassic
Corallian Group
Upper Calcarious grit
Coraline Oolite Formation
Coral Rag
Malton Oolite
Middle calcarious grit
Hambleton Oolite



		Lower calcarious grit	
	Oxford Clay		*the scarp face*
		check thin layer of Cornbrash below Oxford Clay above Ravenscar group palass	
	Kellaways sandstone	*soilsguide is this upper jurassic*	
Middle Jurassic		*or deltaic series extent unclear (staithes)*	
	Grey Limestone		
	Middle Esturine		
		Coal Seam	
	Lower Esturine (sandstone)		
		Ellerbeck bed ironstone	
	Dogger		*dogger is below ravenscar group above upper lias - palass*
		alum shales	*these taken from JS Owen*
		top jet dogger	
		jet shale	
		Dogger ironstone	*archmetals has this within dogger , below jet/alum shales*
Lower Jurassic	upper lias		*Whitbyjet has dogger/alum/jet...grey shale in upper lias*
		Grey shale	*is Owen's grey shale upper lias*
	Middle lias		
		Main	
		Pectin	
		2 foot	
		Avicular	
	Lower lias		

Bilsdale Web site

The rocks of Bilsdale were laid down about 180 million years ago during the Jurassic period. The area was covered by sea and located closer to the equator. Conditions varied as the sea level changed. Sometimes the land rose above the sea and was covered in dense foreasts. Geologists have identified 3 distinct phases, the Lower, Middle and Upper Jurassic periods.

These flat sea beds were eventually pushed up and twisted when the Alps were forming in Europe, so they now tilt gently to the south. The continuous process of erosion has removed more than 3,000 ft of rock, so the streams in the northern part of the dale now cut into the Lower Jurassic lias shales. The surrounding dale and moors consist of layers of Middle Jurassic rocks and, to the south, the climb up Newgate Bank takes you onto the Upper Jurasic limestones and sandstones.

Within the Middle Jurassic layers are the ironstone, jet and alum deposits which have been extensively mined and formed the basis for early industry in the dale. *To check*

During the last ice age which finished about 12,000 years ago, the ice sheets did not cover the moors. Lakes formed between the ice and the northern scarp face so melt waters regularly flowed down Raisdale and Bilsdale creating the gaps between Live Moor, Cringle Moor, Cold Moor and Urra Moor. As the water flowed down Bilsdale a V-shaped valley was created. Springs emerged along the valley sides between the Lower and Middle Jurassic rocks and eroded the valley sides further to produce the present U-shaped valley.

As the ice receded, trees and vegetation spread over the area and changed as the climate warmed. The moor tops were heavily forested, and the valley bottons were wet and boggy. Bronze Age man created tracks across the moors and cleared the forests. This lead to severe erosion and the formation of the peat.

With the development of the heather moors, the area became popular for grouse shooting and the moors are now managed to support this.

We would like to develop this brief summary further. If you would like to help please contact us

Bygone Bilsdale

Even the most casual visitor to Bilsdale notices the climb up Clay Bank then the farms dotted along the valley floor, and occasionally sandstone cliffs appear high up the valley sides before the heather moorland takes over. Finally the visitor leaves Bilsdale by ascending Newgate Bank. Some people may wonder why Bilsdale is this shape. To answer this question we must go back 200 million years to a time when the whole area was submerged under the sea.

All the rocks in Bilsdale were laid down as mud and sand over the 60 million years of the Jurassic period. Inevitably conditions varied over such a long timescale. The sea levels changed many times. There were periods when land appeared and forests grew, only to be submerged again. Geologists have identified three distinct phases in the Jurassic age – the lower, middle and upper Jurassic periods.

In the lower Jurassic period the sea invaded on three separate occasions. A series of fine silt and mud was laid down often trapping the remains of sea animals. The muds became the shale which can be seen in the valley bottom, particularly where the streams have cut down and the animal remains became fossils. It was about this time that the ironstone, alum shales and the wood that was to become a hard layer of jet were laid down. All these minerals were later mined in Bilsdale. In total the lower Jurassic shales beneath Bilsdale are about 1500 ft thick.

During much of the middle Jurassic period a huge river delta covered the North York Moors. Sometimes the sea invaded but there were extensive periods when vegetation covered the sandbanks. Layer upon layer of sand was deposited and over time this became 500 ft of sandstone which now forms the valley sides. Most of the houses in Bilsdale are built from this sandstone. The sea returned in the upper Jurassic period, but it was relatively shallow and produced fine sandstone and limestone.

It is more than 120 million years since the last of the rocks in Bilsdale were deposited in the Jurassic sea and the flat beds have been pushed up and twisted, particularly at the time when the Alps were formed in Europe. There is now a gentle tilt to the south east and this determined the course of the early River Seph which cut into the rocks to form Bilsdale.

After heavy rain many of the small streams which feed the river Seph seem muddy with silt from the moors. This continuous process of erosion by wind and rain has removed 3000 ft of rock, perhaps much more . It is probable that the chalk of the Yorkshire Wolds once covered Bilsdale but there is no trace today. Even most of the upper Jurassic sandstone and limestone has been removed . There remains a small strip to the south of bilsdale and the climb up Newgate bank takes the traveller from middle Jurassic on to upper Jurassic rocks. The steep valley sides of Bilsdale are formed of middle Jurassic sandstone and only on the valley floor and lower slopes can the lower Jurassic rocks be seen.

Notes

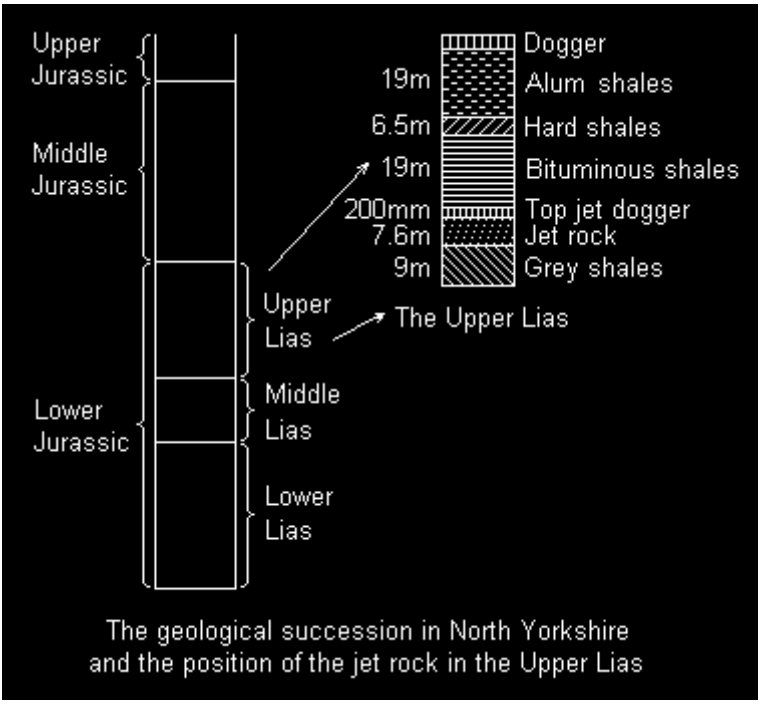
following transcribed from http://archmetals.org.uk/geology-and-geography.html

Grey Limestone
Middle Esturine — Coal Seam
Lower Esturine (sandstone)
Dogger — Jet/alum shales
Dogger ironstone

Upper lias
Middle lias — Main
Pectin
2 foot
Avicular

Lower lias

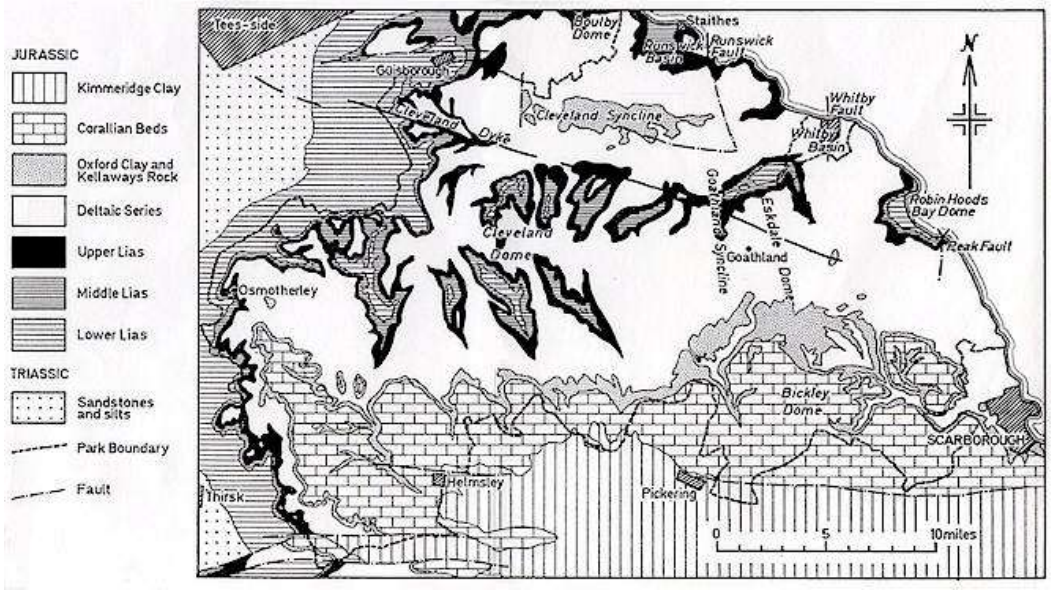
http://www.whitbyjet.co.uk/about-jet/mining.html — Whitby Jet heritage Centre

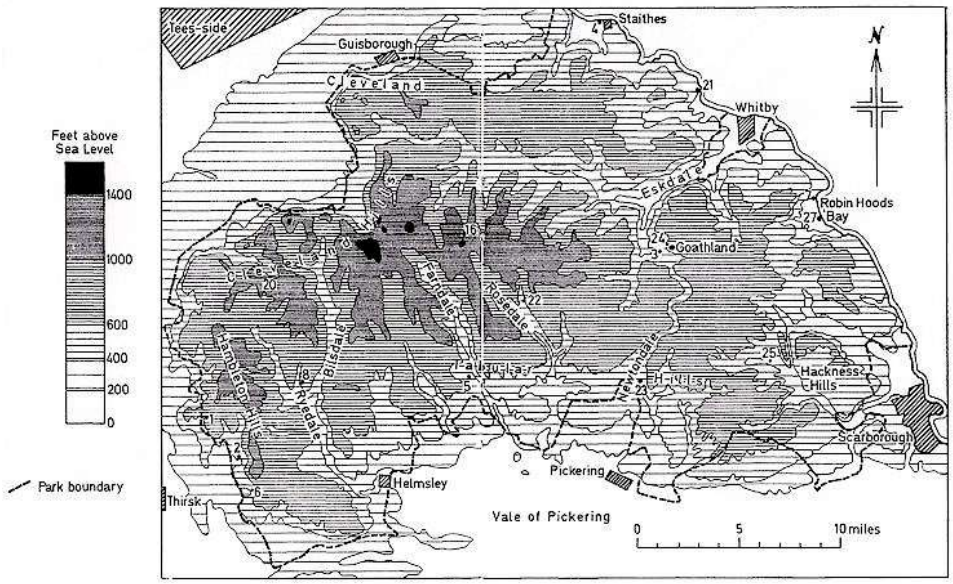


The geological succession in North Yorkshire and the position of the jet rock in the Upper Lias

Upper lias — dogger
Alum shales
Hard shales
Bituminous shales
Top jet dogger
Jet rock
Grey shales

http://www.staithes-town.info/geology/physical-map.asp





https://www.landis.org.uk/services/soilsguide/mapunit.cfm?mu=63101

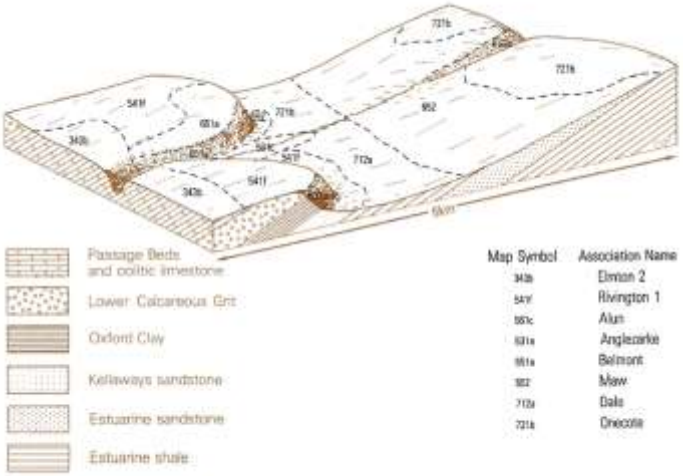


Figure 19. Soil associations on the North York Moors, North Yorkshire

http://www.palass.org/meetings-events/annual-meeting/2014/annual-meeting-2014-field-guide-tropical-yorkshire

The North York Moors National Park Ian Carstairs 1967

Four stages – sedimentation, folding, uplift, erosion
Jurassic period, 210m years ago area under a deep sea sediments deposited slowly, compressed to form grey shales
3 main divisions, lower, middle and upper
Then folded and period of erosion before more deposits an iron rich sandstone the Dogger
By the Middle Jurassic there was a huge delta fed by rivers from Scandinavia
Freshwater muds, sand and silts deposited Sea invaded 3 times leaving a seam of marine deposits
Shallow seas produced limestone and sandstone became the sandstone of the moor tops near Bilsdale
Culminated in a thick layer of Kimmerige clay followed by a period of uplift and erosion *under water?*
The 4th time the area remainedsubmerged *when exactly*
"with the areastill underwater, thick beds of chalk, the rmains of sea creatures, laid down during the cretaceous period – started 145m years ago

The North York Moors, Stanhope White, 1979

Copied from early man.doc in bsgmlb\mal research

Iceage ended 15k years ago pp7
William Smith geologist b 1769 father of british geology names lias, gaelic fo flat stone pp12
Cleveland dyke igneous rock from Isle of Mull pp 15
Laying down the rocks pp19-28
Mountainbuilding 30-60m years ago when Africa/India plate collided with Eurasia & alps formed
280m years ago Britain, namerics grenland formed laurasian plate pp 19
Had move northwards, now at 20deg – tropics
There are mountains in Scotland & wales from previously, lake district & early pennines formed by faulting not folding, undulating plain to south, extensive plain eastwards to the urals, now about 5000 - 7500ft below sea level. In the east was the zechstein sea. The area was a desert, with sand dunes similar to sahara.
On 3 occasions plate lowered, sea spread west, evaporated then covered by sand
Potash, salt & anhydrites deposits pp21 – end of permian
In Triassic area is a desert, river from france fanned out to Cheshire, laid down silts, now under vale of York, easiy eroded hence western escarpment pp 22
180m years start of Jurassic, marine conditions as the plate sank, mountains largely worn down permian & Triassic deposits lie east of pennines
Initially relatively shallow sea, lias laid down, 900ft in eskdale
Muddy sea of lower lias became shallower, . middle lias – shales and sandstones laid down in shallow sea near coast, includes ironstone - ironstone/pectin/2 ft/avicula pp24
Plate sank cf black sea, lot of ammonites, and close by, aurocarian trees washed down by rivers? became jet
Towards end of liassic period some earth movements, shallow basins, low domes –subsequently false bedding
Liassic sea slowly filled with sand & pebbles from river from north from carboniferous millstone grit formation – large delta developed, , moving channels, concentrated iron particles ie rosedale, plants ferns grew but inundated by floods, , from time to time land lowered, marine conditions, then delta again, vegetation became coal –pp26 presumably middle Jurassic
Whole area sank,tropical sea, corals, formed tabular hills, plate warped downward, killed coral, kimmeridge clay, under vale of pickering
Some uplift & erosion then land sank, deep clear tropical sea, remains of sea animals created1500 ft chalk
70m years ago area rose to become dry land, Britain now45deg north10,000 ft deposited in 200m years since carboniferous? Check pp27
Then great extinction, he says magnetic reversion, no van allen belt so solar winds of radiation
Ch3

In past 70m years all Jurassic & cretateous eroded from vale of York/pickering? boulder clay is on Triassic, so 2-6000ft eroded 1/1000in a year.
Following uplift rivers formed flowing from pennines to sea over chalk of varying thickness – tees, swale, ure, nidd, wharf, aire, calder, don pp31 don captured upper calder, later calder captured upper aire as rivers cut down to softer Triassic rocks. Eventually all captured except tees – hence the ouse
40m years ago plates moved, alpine earth storm pp32, created atlas & himmalayas over next 10-13myears – antecline over the moors, syncline in vale of pickering plus faults at Runswick, Whitby & ravenscar (peak fault- not formed in middle lias priod). 2 implications, Triassic rocks brought closer to surface, more rapid erosion from vale of Mowbray created re-entrant near ingleby grenhow? 2. New series of consequent stream formed running north to south, Rye, Seph, Ricall, Hodge Beck,Dove Seven, creating the dales, and streams into the esk.
Th esk is a relic of the lower course of the Swale
North facing scarp face of Corallins created by lower course of r ure, as it cut into the softer sandstone below the harderlimestones which cap the corallines
Southern chalk escarpment of pickering may have been created by lower coure of Nidd pp33
Tees created th n facing escarpment along eston hills
27m years ago crack from isle of mull to e of goathland to form Cleveland dyke

Basic shape of landscape was in place about 2m years ago but, 200ft higher, sea further east, west scarp not only higher but v of York 200 ft lower. V of pickering different with slow meandering river from Gilling to filey – no newtondale, no forge valley pp34
He says the vegetation 2m years ago probably similar to today??
Ice Ages
2m years ago series of ice ages started, 4 big ones, 18 small ones pp36
160k years ago, ipswichian interglacial, Palaeolithic hunters may have roamed moors, but no evidence – kirkdale cave, African animals, elephant, rhino, but later cold animals, mammoths
Last ice age devensian, started about 160k years ago pp39
Onset of ice age described pp 39 ice flowed around nym, nunatak – above the permafrost , frost action creates deep soil for alpine plants, but becomes waterlogged &slips down slopes
Devastating flood waters in vale Mowbray each summer.
Nb glacial landscapes bridestones on grime moor 874915
As thr ice pushed forward lakes formed in summer, initially overfloewded at edge each summer, later ice thicker, lake deeper, found new exit to south, eroded channel, then ice crept in in winter – meltwatersin these slacks each summer
As ice moved south lake guisbro formed for a time pp42

http://www.scotese.com/moreinfo10.htm

More Info about the Jurassic

Pangea was assembled piece-wise. The continental collisions that lead to the formation of the supercontinent began in the Devonian and continued through the Late Triassic.
In a similar fashion, the supercontinent of Pangea did not rift apart all at once, but rather was subdivided into smaller continental blocks in three main episodes. The first episode of rifting began in the middle Jurassic, about 180 million years ago. After an episode of igneous activity along the east coast of North America and the northwest coast of Africa, the Central Atlantic Ocean opened as North America moved to the northwest (See Jurassic). This movement also gave rise to the Gulf of Mexico as North America moved away from South America. At the same time, on the other side of Africa, extensive volcanic eruptions along the adjacent margins of east Africa, Antarctica, and Madagascar heralded the formation of the western Indian Ocean.
During the Mesozoic North America and Eurasia were one landmass, sometimes called Laurasia. As the Central Atlantic Ocean opened, Laurasia rotated clockwise, sending North America northward, and Eurasia southward. Coals, which were abundant in eastern Asia during the early Jurassic, were replaced by deserts and salt deposits during the Late Jurassic as Asia moved from the wet temperate belt to the dry subtropics. This clockwise, see-saw motion of Laurasia

also lead to the closure of the wide V-shaped ocean, Tethys, that separated Laurasia from the fragmenting southern supercontinent, Gondwana.

http://www.bbc.co.uk/nature/history_of_the_earth/Cretaceous

Triassic period - The Triassic began after the worst mass extinction ever, at the end of the Permian. Life on Earth took a while to recover and diversify. The Triassic was characterised by heat, vast deserts and warm seas. Even the polar regions were warm, so lush forests grew there. However, the lack of other life, coupled with the period's particular environmental conditions, opened up some evolutionary opportunities. As a result, the very first mammals and dinosaurs evolved. During this time, the giant supercontinent of Pangaea began to break apart. The period ended as it had begun, with an extinction event that wiped out many species. **Began: Permian mass extinction 248 m Ended: Triassic-Jurassic mass extinction 205 m**

Jurassic period The Jurassic began after the mass extinction event. Life, however, was quick to recover from this blow and the Jurassic eventually became host to the most diverse range of organisms that Earth had yet seen. Amongst them were the first birds and some of the dinosaurs. Continental break-up during this time gave rise to the sea that would eventually widen to become the Atlantic Ocean. The ocean floor that formed at this time is the oldest surviving on the planet - all older ones having now been 'recycled' through plate tectonics.**Began: Triassic-Jurassic mass extinction 205 m Ended: 142 m**

Cretaceous period - The Cretaceous ended with the most famous mass extinction in history - the one that killed the dinosaurs. Prior to that, it was a warm period with no ice caps at the poles. Much of what we now know as dry land - such as southern England and the midwest of the USA - was underwater, since sea levels reached their highest ever during this time. The Atlantic Ocean grew much wider as North and South America drew apart from Europe and Africa. The Indian Ocean was formed at this time, and the island that was India began its journey north towards Asia.**Began: 142 m Ended: Cretaceous-Tertiary mass extinction 65 m**

Palaeocene 65-54.8 Eocene epoch 54.8-33.7 himalayas Oligocene epoch 33.7-23.8 Oligocene epoch the start of the global cooling Miocene epoch 23.8-5.3 apes becoming widespread in the Old World Pliocene epoch 5.3-2.6 the human lineage split away from the chimpanzees' early on Pleistocene epoch 2.6m 11.7k glaciers came and went Holocene 11.7-now started when the glaciers began to retreat. See *world_epochs.doc* for more details