

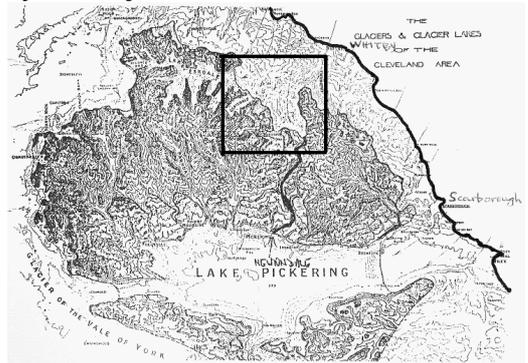
N.E.G.S. July 13<sup>th</sup> 2008

.....“like furrows on the aged cheek where tears have ceased to flow”.....  
(T. Belcher. 19<sup>th</sup>. C. on his travels around the North York Moors, referring to the glacial drainage channels.)

### The Cleveland Tertiary Dyke and The Effects of the Last Glaciation on the North York Moors. “Fire and ice.”

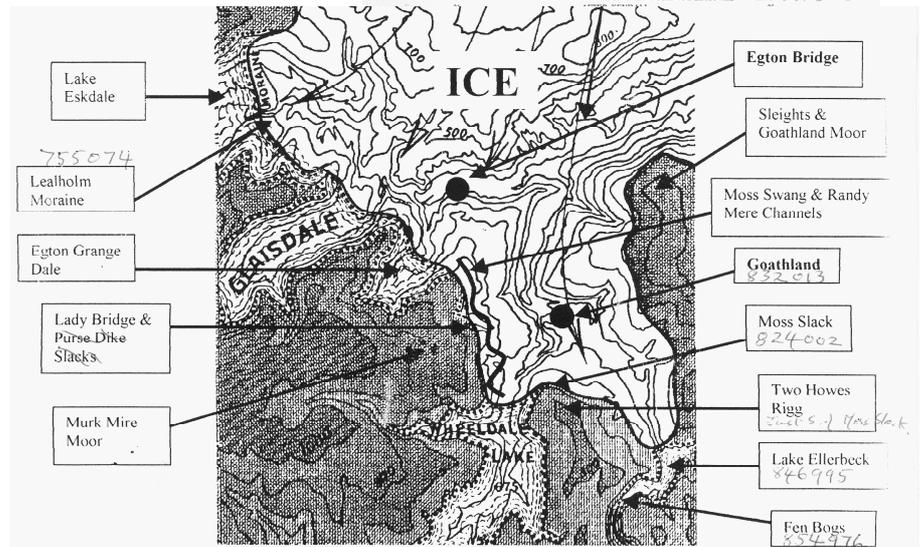
The Devensian cold period of the Pleistocene (2Ma.- 10Ka.) epoch began about 115,000 yrs. BP and ended about 10,000 BP. Glaciation took place during the late Devensian, beginning ~26,000 BP, reached a maximum at ~18,000 BP. & ended ~10,000 BP.

In 1902 Kendall published his monumental paper “*A System of Glacial Lakes in the Cleveland Hills.*” In it he explained how the existence of lakes and glacial melt water channels were the result of the Moors being almost surrounded by ice. Moorland over about 800ft. was not invaded by ice sheets or glaciers. Furthermore, the moors were not of sufficient height to generate ice sheets or glaciers. Consequently, meltwater which accumulated in some of the dales, e.g. Eskdale and its tributary dales found escape routes via channels, many of which can be identified because they



are anomalous to the present day drainage systems and/or no longer carry streams within them.

Surrounding ice plus melt water from it as well as runoff from higher ground led to the formation of **Eskdale & Vale of Pickering** lakes. Their formation and interrelationship was the problem Kendall attempted to solve. He started his work at Newtondale & carried his research going back step by step to complete the picture of lakes & glacial drainage channels.



He postulated that the lakes would overflow producing drainage channels either away from the ice margin, which he called **direct overflow channels**, or parallel to the ice margin which he called **marginal overflow channels**.

It must be pointed out, however, that the existence of “overflow channels” has been re-examined, (e.g. Gregory 1962). He argued that many of the channels could have been subglacial, i.e. flowing beneath stagnant ice.

This field excursion will focus on glacial drainage channels in the Goathland area and their relationship to the huge gorge of **Newtondale**.

The map shows how the ice front blocked the eastern end of Eskdale, leaving a terminal

moraine at **Lealholm**. The ice also moved down the **Murk Esk**, one lobe going down **West Beck** towards Wheeldale as far as **Nelly Ayre Force**, the other going down **Eller Beck**, both of them tributaries of the Murk Esk, towards Newtondale. The lobes were separated by the north facing spur of **Two Howes Rigg**, c. 1km S.W. of Goathland.

Kendall maintains that when "Lake Eskdale" reached a height of 750ft. It overflowed carving to the south of the Lealholm Moraine the present day gorge of **Crunkley Gill**, (an incised meander). The water flowed via **Glaisdale** and **Egton**

**Grange**, tributary valleys of Eskdale. When the lake in Egton Grange reached a height of about 730ft. it cut a channel over Murk Mire Moor, the channel now known as Lady Bridge Slack and its continuation Purse Dyke Slack. The drainage continued towards the valley of **West Beck**, creating **Lake Wheeldale**.

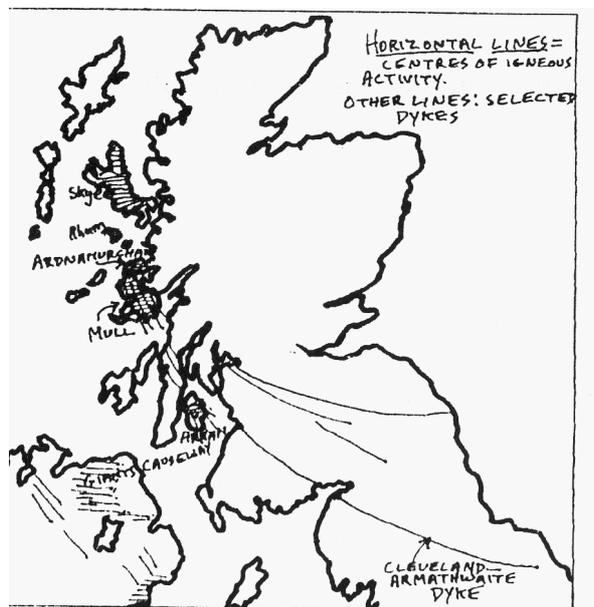
Water from the latter overflowed via **Two Howes Rigg** via the **Moss Slack** marginal channel. This latter channel plus melt water from ice to the north created a small **Lake Ellerbeck** which subsequently overflowed creating the huge direct overflow channel of **Newtondale Gorge**, beginning at **Fen Bogs**. Newtondale Gorge emptied into the Vale of Pickering, helping to create Lake Pickering, the latter emptying into Lake Humber via Kirkham Gorge.

Recession of the ice front led to the abandonment of Lady Bridge, Purse Dyke & Hollins channels. The ice then stabilised long enough to cut at a lower level the almost parallel channel of **Moss Swang** and its continuation at **Randay Mere**, part of which is now used as a reservoir. The abandoned channel at **Castle Hill**, resulting in a hanging valley is probably due to the Moss Swang channel having a secondary channel flowing southwards. However, it was only temporarily occupied until the main channel (Moss Swang) was cut.

### The Cleveland Dyke at Duckscarr Quarry & Goathland Moor

About 56 million years ago, crustal tension due to the opening of the Atlantic resulted in the intrusion of a number of linear igneous rocks known as dykes, many emanating from the Isle of Mull in Scotland. e.g. the Cleveland, Tynemouth and Acklington Dykes. They form part of the British Tertiary Volcanic Province. The Cleveland Dyke is visible in places from Mull, passing through the Southern Uplands of Scotland, Cumbria at Armathwaite where it crosses the River Eden, Durham county at Bolam and on to the North York Moors. Sites where it was quarried can be seen in several places, e.g. at Great Ayton, Castleton and Egton Bridge.

From the vantage point of Roseberry Topping the dyke, being a more resistant rock, can be seen to form a distinct ridge running in a WNW-ESE direction, from which Langbaugh (Long



hill), an area of Cleveland, gets its name. The ridge can be seen most clearly at the top of Cliff Rigg quarry near Great Ayton.

The tough rock of the dyke has been extensively quarried for road stone, as can be seen in several places where it outcrops. A spectacular line of quarrying, known as the Whinstone Ridge, is visible on the moors about 2km. N.E. of Goathland.

Its metamorphic effect on adjacent country rock is small; slight induration and spotting of shale. The dyke is dark grey to black, fine grained. Small glassy crystals (phenocrysts) of feldspar can be seen scattered about. It is classed as a basaltic andesite, its main minerals being plagioclase feldspar, pyroxenes (augite & pigeonite), and opaques (iron oxides) set in a glassy (sometimes devitrified) matrix. According to some authors, the dyke (volume *c.* 85 km<sup>3</sup> was initiated in a large magma chamber below Mull subject to a small excess magmatic pressure. Lateral migration at relatively high velocity (1–5 ms<sup>-1</sup>) caused emplacement of the dyke in 1–5 days. Following emplacement, minor vertical ascent of magma may have contributed to the local en echelon distribution of dyke segments. More information about the dyke can be found on the TVRIGS website: [www.tvrigns.org](http://www.tvrigns.org)

### ITINERARY

1. Meet Egton Bridge car park at NZ8044 0537
2. Duckscarr Quarry - Cleveland Dyke. NZ7979 0528
3. Lady Bridge Slack intake NZ7999 0293
4. Carry on south on Murk Mire Moor to turning point, NZ7965 0122
5. Castle Hill. Moss Swang intake. Double channel at Castle Hill. Park at NZ8088 0348
6. Pass Randy Mere reservoir. Possible stop at approx. 814016
7. Moss Slack NZ8241 0016 on Two Howes Rigg: Park at NZ8262 0067 near Goathland Parish Church.
8. Possible look at Channel behind Goathland Parish Church. NZ82800 0064
9. Entrance to Newtondale Channel at Fen Bogs. Park at SE8554 9863, near junction with A169.)
10. Goathland Moor to see trend of Cleveland Dyke. Travel north up A169 Sleights/Whitby road, turn left onto Goathland road, park at next road junction at NZ8520 0286

### REFS:

A System of Glacier-Lakes in the Cleveland Hills. 1902. P.F. Kendall. Q.J.G.S. Vol. 58 pp. 471-571  
Newtondale, the Forge Valley and the other Gorges in the North Yorkshire Moors. 1989. S. White. Pub. by the author. ISBN 0 9512215 1 5  
Yorkshire Rocks and Landscape. 2006 Excursion 11 J. Senior & J. Rose. Pub. Y.G.S.

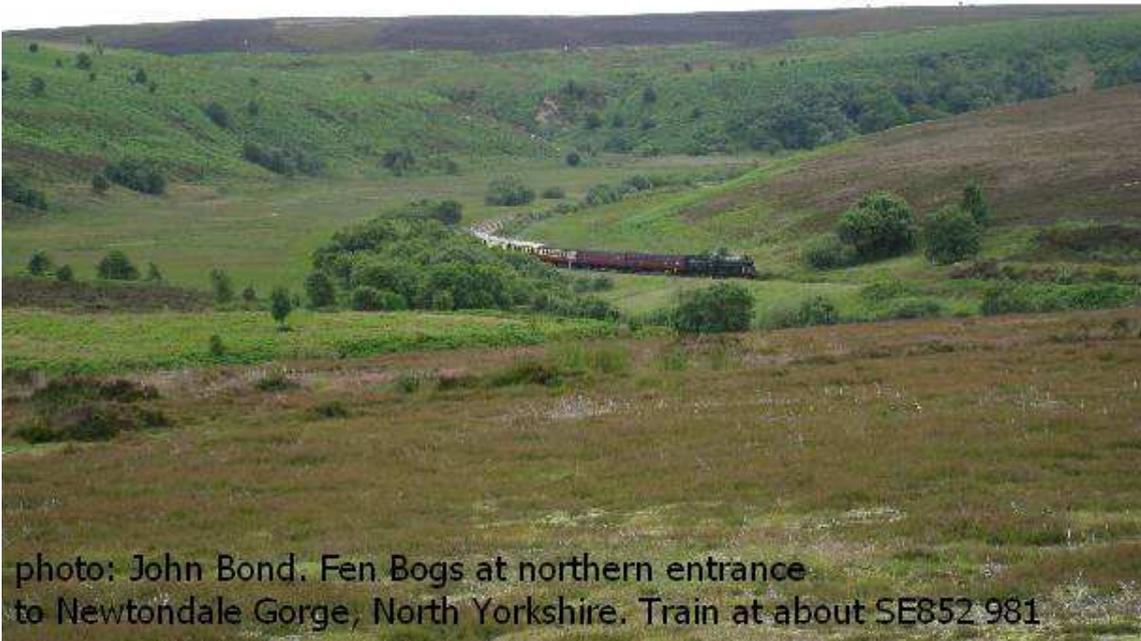


photo: John Bond. Fen Bogs at northern entrance  
to Newtondale Gorge, North Yorkshire. Train at about SE852 981

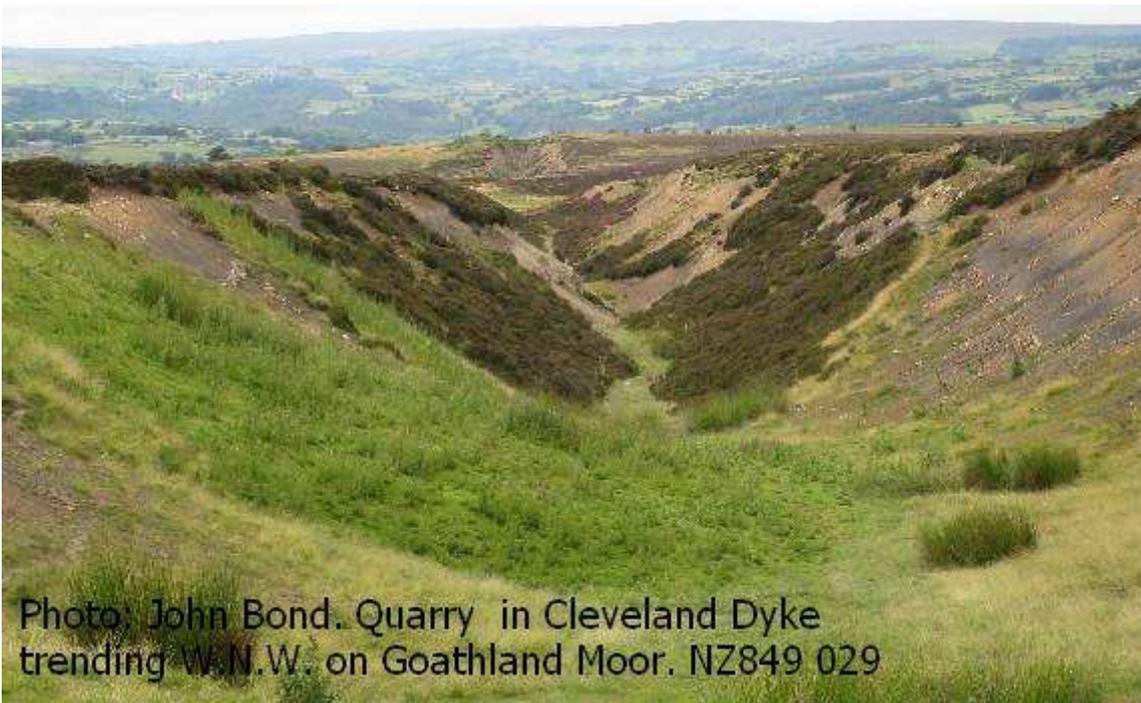


Photo: John Bond. Quarry in Cleveland Dyke  
trending W.N.W. on Goathland Moor. NZ849 029