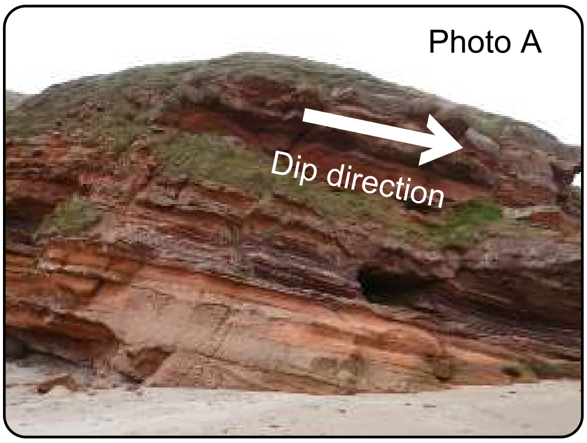
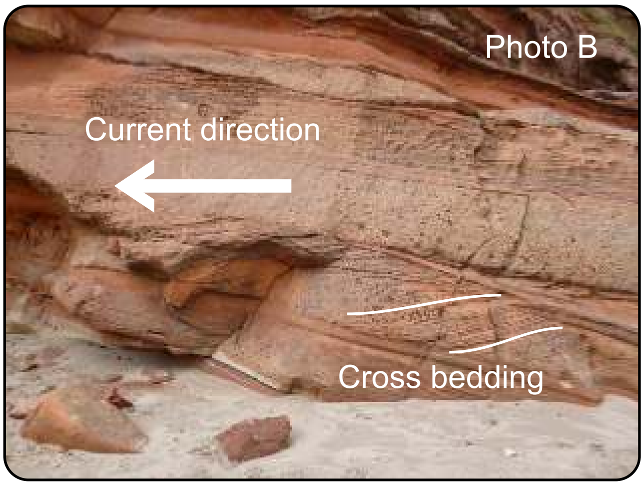
PEASE BAY

Visit the glorious beach at Pease Bay to see spectacular views along the cliffs of the Berwickshire coast and find out more about the time when Scotland lay in arid climates close to the equator 360 million years ago by looking at the attractive and unusual features of the red rocks of the headlands.

Visitors to Pease Bay should park in the car park just inside the entrance to Pease Bay Holiday Park on the right hand side [NT 794 706]. The walk is less than a mile, through the caravan park and across the beach, to look at the rocks on the headlands. Keep away from cliffs after heavy rain. Toilets are available at the caravan park. **TO SEE THE ROCKS IN SAFETY, MAKE SURE YOU VISIT AT LOW TIDE.**

Turn left when you reach the beach to see the best exposures of the Devonian red rocks and walk towards the first headland (Photo A), made of red sandstones.
The red colour comes from iron washed through the cracks in the rock and deposited unevenly in the **pore spaces** between the sand grains. This shows that the rocks were deposited on a continent which lay in arid latitudes, south of the equator, about 360 million years ago at the end of the **Devonian period**. The rocks on this coast were tilted to the north-east after they were deposited, as shown by the **dip** direction arrow on Photo A.





A close look at the **cross-bedding** on the **sandstones** in Photo B reveals that sand particles were rolled along river beds by flash floods and formed sandbanks in river channels. The lee side (downstream) of the sandbank is preserved as a series of sloping beds of sand, while the top of the sand-bank is **eroded** away by the river. This process means that sandbanks move downstream slowly in the direction of the cross-bedding - from right to left on the photo. Each **bed** of sandstone may have taken only a few weeks to be deposited.

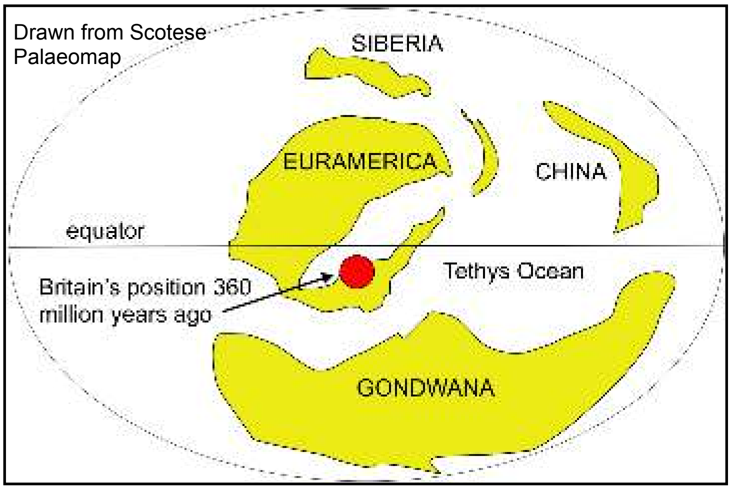
Photo C shows that the rivers were carrying mud and silt as well as sand grains. Mud is made of **clay particles** which are micro-scopic in size and are floated along easily by water currents. Once the speed of the current drops in an estuary or a lake, the clay particles settle out on the bottom and stick together by surface tension.

This process can only take place in still water and the clay and silt beds (called **laminations** when they are very thin) in Photo C will have taken many years to accumulate. Some-times flakes of mud, which had been hardened when a pool of water dried up, were picked up by river currents. They would have been dragged along the river bed and deposited when the speed of the current dropped. They are called **rip-up clasts** and are shown in Photo D. The scale card is 10 cm long.

Walk around the headland to the second bay, which is only accessible at low tide. **TAKE CARE.**

The headland on the far side has red sandstones at the base, but the younger rocks which overlie them at the top of the cliff are grey. The junction between the red and grey rocks is close to the boundary between the **Devonian period** (416-359 million years) and the **Carboniferous period** (359-299 million years). The climate was becoming less arid as the continent was drifting northwards into the equatorial zone where there was much greater annual rainfall.

WHERE WAS BRITAIN AT THE END OF THE DEVONIAN PERIOD?



The global map shows the position of the continents 360 million years ago. **Gondwana** was close to the south pole and Britain was positioned on the southern side of the continent of **Laurussia**/Euramerica, which became Asia, Europe and North America. Our continent was moving slowly north towards the equator.

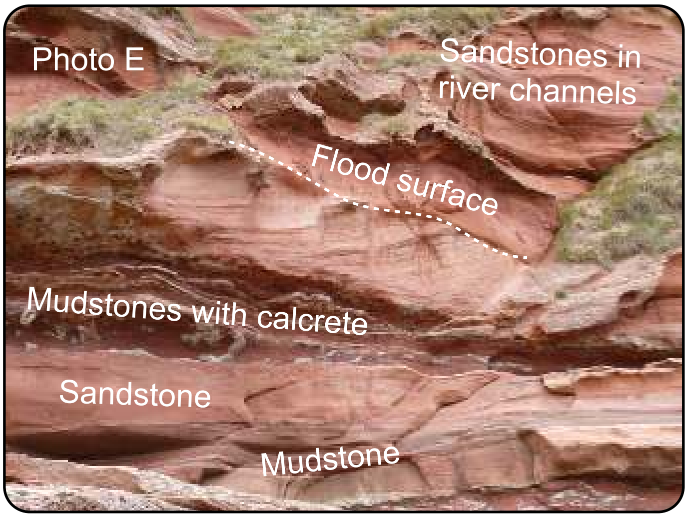


Photo E shows an exposure of pink and white Devonian sandstone with large-scale cross-bedding, which suggests that the river channels were larger and that floods were more frequent. White patches in the **mudstones** between the two sandstone beds are **calcretes**, lumpy nodules of the mineral **calcite** which were **precipitated** on the dry land surface during arid times. The rocks on this cliff show how weather patterns changed, fluctuating between heavy rainfalls and seasonal arid periods.

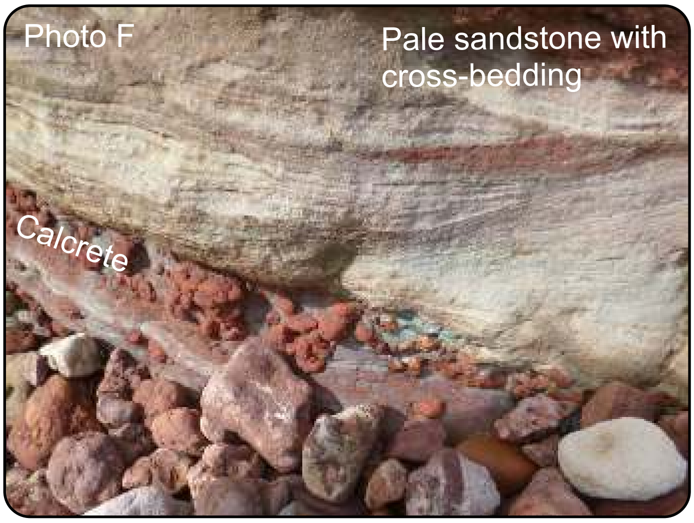


Photo F shows pink and white Devonian sandstone with cross-bedding, alternating with beds of knobbly calcrete. There are also small circular pale patches and layers in the red sandstones, which show where microbes living in wet sediment used up the oxygen in the iron minerals.

HOW ARE WET SANDS TURNED INTO SANDSTONE?

For sediments such as **clay particles,** silt and sand grains to become hard rocks, they need to be squashed so that any water is driven off. This process takes place when they are buried under later sediments, probably as deep as several kilometres. Water moves between the grains carrying iron and **silica** and is then deposited as a cement in the pore spaces between the grains of sand or silt and the clay particles. Geologists don't really understand why some sections of the sandstone are reddened by iron and others are not. Over many millions of years of pressure, the rock becomes tougher and is able to resist **weathering** and **erosion** processes.

Geologists sometimes take small samples of rock for research. The small bore holes and the names incised in the rock (Photo G) have been eroded by the sea in the last few decades.

USEFUL REFERENCE BOOK

Lothian Geology - An excursion guide 1996
A.D.McAdam & E.N.K.Clarkson

USEFUL MAPS

OS 1:50,000 Landranger 67 Dunbar

OS 1:25,000 Explorer 346 Berwick-upon-Tweed

British Geological Survey 1:50,000 Scotland Sheet 34 Eyemouth (Solid)