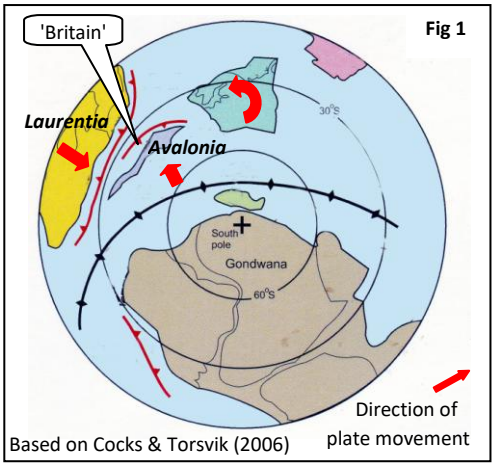
Geological History of the area around Helwith Bridge

Fig 1. <u>Ordovician</u> to <u>Silurian Period</u> (460 - 420 million years ago)



What was to become the north of England lay far to the south of the equator at the bottom of the ***Iapetus Ocean,*** a deep sea which existed between the continents known as ***Avalonia*** and ***Laurentia*** that were slowly moving together. Sediment eroded from ***Avalonia*** was being washed into the sea where sands and silts settled in the shallower, coastal waters while mud was carried out to settle in the deep ocean. Earthquakes, generated by the closing of the continents, periodically shook loose the sands and silts on the continental shelf causing them to avalanche out into the deep ocean. These submarine avalanches are called **Turbidity Currents** and flowed at high speeds and for great distances, picking up muddy sediments from the sea floor as they travelled over it. Finally, as they lost energy on the flat ocean floor, the sediment settled out, covering a vast area in layers of fine sand and mud over 1 kilometre thick.

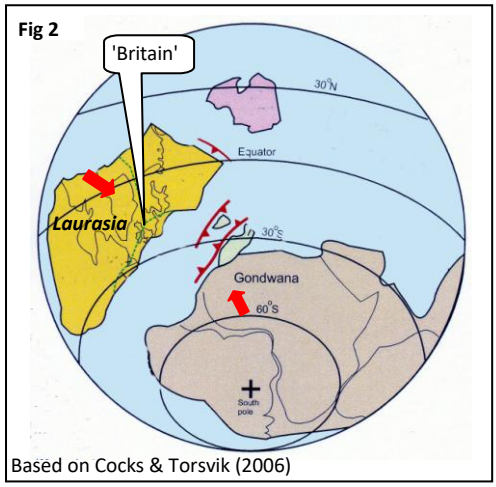
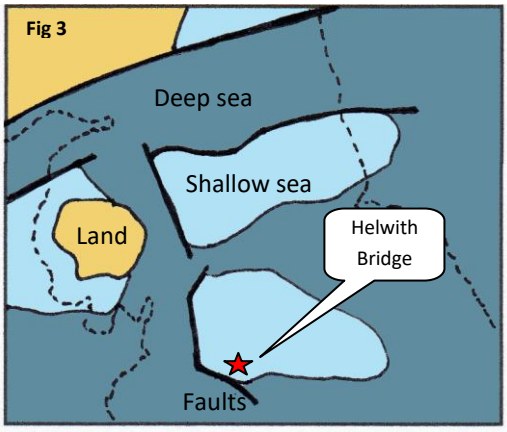


Fig 2. <u>Late Silurian</u> to end <u>Devonian Period</u> (420 - 360 million years ago)

The continents had collided creating a new one called ***Laurasia***. The sediments on the sea floor (now turned to rock) were forced up to form a range of fold mountains of Himalayan proportions with the Yorkshire area lying in part of the foothills. Mountain ranges have more rock *below* them than above (like an iceberg in water) and those rocks that were forced down were heated and squeezed. Northern England lay south of the equator in the tropics and over the next 70 million years underwent a continuous period or erosion. In the Yorkshire area the mountains were eventually worn down to a gently undulating relief with the rocks that had been deeply buried now at the surface and it is these that are being quarried today.

Fig 3. <u>Early Carboniferous Period</u> (360 - 330 million years ago)



The part of **Laurasia** which was to become Britain lay across the equator and new tectonic forces were stretching the crust causing it to split into sections along fault lines. Some sections subsided and were flooded by deep sea while others were more buoyant and only became flooded by shallow seas. Helwith Bridge lay on the edge of one of the buoyant sections whose boundary, marked by the **Craven Fault System,** lies less than 1 km to the south. The shallow, warm sea teemed with life and the shells and skeletons of animals steadily accumulated on the sea bed which initially consisted of the upturned, eroded edges of the older rocks. Slowly rising sea level allowed over 100m of shell debris to accumulate which, over time, turned into thick beds of **limestone** called the ***Great Scar Limestone Group.*** The boundary between these and the Silurian rocks below is called an ***unconformity*** as there is no rock record of what happened in the 70 million years that separates them.

Recent events

Over the past 2.5 million years repeated glacial events excavated the Ribble Valley removing all the younger rocks that had been deposited on top of the limestone and, around 14,000 years ago, exposing the unconformity**.**

The Quarries.

Rock has been quarried around Helwith Bridge for over 300 years; it is how they were deposited and what subsequently happened to them that has made them valuable. The older rocks were originally layers of muddy sediments called ***siltstone*** with some ***sandstone*** but, when caught up in the mountain building event, heating and squeezing toughened them and caused some to split easily in one direction. It was the ones that split easily that were first exploited as ***flagstone*** and '***slate'*** which had a multitude of uses in buildings and as monuments. Later the slight coarser grained rocks became valuable as road stone as not only are they strong but they also have a high resistance to polishing which is ideal for surface layers. **Limestone** was worked mostly to make agricultural lime.

William Fraser. June 2017