Student exercise at Poxwell Quarry.

This exercise is based on Poxwell Quarry, G.R. SY 743835. There is a 'Geology in the Landscape' leaflet linking this quarry to a walk around the Poxwell Pericline, which will provide some useful information and can be looked at during your visit and can be obtained through the DIGS website. Some follow up work is possible, especially on the properties of the rocks seen in the quarry. The rocks in the quarry are of upper Jurassic age, around 140 million years old and are called the Portland and Lower Purbeck Beds. If you haven't got a compass to work out directions, use the position of the sun and the time of day, remembering the sun rises in the east and sets in the west. Some of the questions here are similar to those for the exercise on Portesham Quarry, as they are relevant to both quarries because they contain similar rocks.

Safety: remember quarries are dangerous, climbing around on the quarry face is hazardous, the work here can be done by looking (observing) and by working at the base of the quarry face. Be careful of dislodging loose rock and be careful of other people working near you.

Most of the rock seen in the quarry face is limestone and the rock has been used in the past for local buildings, in this case probably for local farm buildings or even Poxwell Manor. The limestone could also have been used for making lime in the nearby lime kiln

(1) Study the quarry faces from a good vantage point so that you can see both faces at the same time. What are the main features you can see?

(2) Moving closer, take a piece of loose rock and describe the colour and the feel of the rock. (white, pale grey, rough, chalky)

(3) The rock is made of small particles of mineral material. Are these coarse, medium or fine? How easy is it to see the individual grains?

(4) Draw a sketch of the quarry face with a scale and label any features you can see such as bedding planes, dipping strata with angle of dip, joints (cracks) massive (thick) beds, thin beds, fossil soil, chert nodules (which are dark grey to black), youngest bed, oldest bed, soil, plants. You can add labelling to the sketch as your knowledge increases during your visit to the quarry. The oldest bed is the one deposited first at the bottom of the sequence; the youngest bed was deposited last at the top of the sequence. Mark these on your field sketch

(5) Note that the layers of rock have been tilted. Originally they were deposited as horizontal layers on the sea floor. What has happened to them? Can you work out roughly or find out more accurately when this change occurred? The rocks in each face are not tilted in the same direction or at the same angle, this is called apparent dip. By careful observation you can find out the true dip, i.e. the steepest angle? This can be done using a protractor or better still a clinometer (a piece of equipment used by geologists to measure dip angles). The dip angles are measured from the horizontal. Note that in the north east face, the beds are dipping to the south east at 11^{o} (apparent dip), in the south east face the apparent dip is to the south west at 15^{o} but the true dip is into the face to the south at 20^{o}.

(6) Measure or estimate the thickness of beds, measure the accessible ones, and estimate the ones that you can't reach.

(7) When close up to the quarry face, what shape are the beds? Flat, vertical, gentle, steep, indented, overhanging?

(8) Can you find chert nodules in the of the quarry faces? What shape are they, how does their surface compare with the limestone?

(9) Are the chert nodules harder or softer than the limestone in which they occur? How can you tell? Which can you scratch?

(10) Chert is made of silica, which is similar to the mineral quartz. Limestone is mainly made of the mineral calcite. Hardness of minerals is measured on the Moh's scale of hardness. Using books or the Internet can you find out the relative hardness of quartz and calcite? What conclusions can you draw about the chert and limestone?

(11) If you can obtain some **dilute** acid, for example hydrochloric acid, compare the reaction of the acid with the limestone and the chert. This acid test is a good one to identify rocks and minerals containing carbonate, e.g. calcium carbonate, which occurs in calcite and most limestone.

(12) In the north east face of the quarry (the one behind the Vodaphone building) there is an ammonite. Ammonites only lived in the sea and are distantly related to Nautilus, which is still living in modern tropical oceans. How can you use this information?

(13) Ammonites are used to date the rocks because they are useful as what are known as zone fossils. The most useful zone fossils only occur in rocks formed during a short period of time and they then became extinct. Ammonites species are very useful in this way for rocks of Jurassic and Cretaceous age that were deposited in the sea as they evolved quickly and then became extinct. However Nautilus has not changed significantly over hundreds of millions of years and is not a zone fossil.

(14) In the south face of the quarry, there is a bed that is made up of lots of thin layers (thinly laminated). This is an algal limestone probably formed in a shallow tropical lagoon. Immediately above it is a dark coloured soil horizon or dirt bed (not continuous and of variable thickness). How did the environmental conditions change from when the bed with the ammonite was deposited to when the fossil soil was formed?

(15) How does the fresh limestone face compare with one that has been open to the air for some time? This shows the effect of weathering.

(16) At the top of the south east face of the quarry there is a tree with roots growing into the bedding planes. This helps to break up the rock and is a form of what is know as biotic weathering that is caused by plants and animals. This can also be labelled on your field sketch.

(17) The rocks in the quarry were mainly formed in the sea, what has happened to the sea level / land level since they were laid down?

(18) Thick (massive) beds formed during times when mud (sediment) was deposited without a break, thinner beds formed when there were gaps / breaks in the mud being laid down. Each bedding plane is a gap in the laying down of the sediment which made the rocks. Can you think how the beds of different thickness might have formed?

(19) If this area was sometimes land and sometimes sea when the rocks were formed, what was the environment / landscape like? Can you draw a sketch to illustrate the conditions?

(20) When you get back to your classroom take a small piece of limestone; weigh it and then place it in a container of water. Can you see anything happening? Do the same with a piece of chert. Is there any difference? Leaving the pieces of rock in the water for 24 hours and then weight them again. Repeat this until there is no change in the weight (mass). What has happened, can you explain this?

For any further information / help contact us through the DIGS website