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**Earth Science background information for KS2 teachers using Meldon Valley, Okehampton.**

The story of the Meldon Valley is told by its rocks. The evidence to explain the sequence of events that took place over millions of years is found here. We have a few exposures of rocks to view at Meldon, but there are also other rock types to see in walls and buildings. Working with Rocks provides the background for work on identifying rocks.
The Teaching Trail Notes list the Key points to investigate:

We are looking at four aspects of these exposures of rock:
1 – to find out how the rocks were formed.
2 – to find out what happened to the rocks after they were formed.
3 – to find out what is happening to them today or in the recent past.
4 – to find out what they have been used for by Man.

**Summary of the Geological History**

The Meldon Valley consists mainly of Lower Carboniferous 350 million year old muddy rocks which were deposited in a deep sea. The end of Carboniferous times was marked by plate collision from the south, which compressed the rocks and baked them hard by the intrusion of hot, mainly granitic, magmas. After millions of years of erosion, further earth movements and erosion, the present landscape owes much to the work of Man.

- 360 - 320 million years ago, during Lower Carboniferous times, this part of Britain was under the sea in a deep-water east – west basin, lying near the Equator. Fine sediment was washed into the basin from distant shallower water areas. Earthquakes probably triggered these submarine avalanches, called turbidity currents. The dark colour of the rocks indicate a lack of oxygen in the deep water. Among the beds of clay mud are dark muddy limestones and silica-rich cherts. Fossils are not common. In time these were compressed to form beds of rock dominated by mudstones.

- 290 - 280 million years ago, towards the end of the Carboniferous Period, much of Britain and north west Europe were involved in a plate collision from the south. The sedimentary basins were compressed and east-west chains of mountains were formed. This episode is called the Variscan orogeny. Melting of the Earth's crust took place at depth and molten magma at 800 $^{o}$C forced its way into these mountain chains. The earliest magmas were silica-poor and formed long dykes of dolerite, the dark, relatively fine grained rock. As the main, silica-rich magma cooled it slowly crystallised, forming the granites found in the hearts of mountains in SW England and Brittany. At the same time the heat was baking the surrounding rocks, turning mudstones into hard hornfels. Metamorphism is the term used to describe changes in rocks caused by heat and pressure.

- Slow cooling of the silica-rich magma enabled large crystals of feldspar to form, with quartz and mica. The last dregs of magma are often forced by earth movements into fractures in the surrounding rocks, forming dykes. The one at Meldon is about 20 metres wide. The much finer grained microgranite cooled relatively quickly surrounded by the already metamorphosed hornfels. Crystals of quartz and feldspar can be seen and there are small amounts of the dark mineral, tourmaline. This particular type of microgranite is called aplite.

- The final hot watery liquids, containing a range of chemical elements, crystallised on the walls of fractures forming mineral veins. The important economic minerals are cassiterite [tin oxide] and sulphides of copper and arsenic.

- Millions of years of weathering and erosion by rivers removed millions of tonnes of rock from the ancient mountains. During the Permian and Triassic Periods [280 – 195 Ma], when Britain lay near the Tropic of Cancer, red sediments were deposited on the landscape from East Devon to Cumbria. They owe their colour mainly to the mineral haematite, an iron oxide. They range from conglomerates [pebble beds] to fine sands and mudstones, deposited as sand dunes or in flash river floods.

- During the Quaternary Period, the last 2 million years, there have been dramatic changes in climate from very cold glacial to mild inter-glacial. Active ice sheets did not reach the southern counties of England, but the climate was still very cold. The landscape was weathered by freeze-thaw action in seasonal cycles, like the Canadian tundra. In summer the top metre of "soil" and broken rock debris locked in ice eventually thaws. The permanently frozen ground [permafrost] beneath prevents water soaking away, so the water-laden surface layer of rock debris is able to slide, avalanche and roll down even gentle slopes. The evidence for this can be found in boulder fields on exposed moors.

- The processes of weathering and erosion are still operating today on rocks in walls, buildings, quarries and the whole landscape. Rocks are weathered by chemical and physical processes, helping to break them down to form soil, which plants quickly colonise. Rabbits, moles minibeasts and plant roots further help to break up rock material and gravity carries it downhill to form new scree slopes at the base of many quarry faces.

- The wildlife and geological features of the Meldon Valley are conserved for the benefit of everyone. We hope that you and your children will enjoy the visit.

- Note that the currently active Meldon Quarry to the northeast **does not** form part of this trail. Hornfels is the main rock type quarried there and is used for aggregates, including railway ballast. It was formerly owned by British Rail, but was purchased by Aggregate Industries. Features of the active quarry include spectacular folding, including overfolding, as well as faulting and dolerite dykes.

- More detailed information on the geological history can be found in the teacher notes for KS3 and KS4.