THE LANDSCAPE'S ROCK FOUNDATIONS

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The British Isles is a special place! It has a diversity of landscapes rarely encountered in such a small geographical area anywhere else in the world. Underlying these landscapes are rocks laid down then altered by geological processes over hundreds of millions of years. Ice Ages scoured out valleys, then deposited their load of rock and clay as they melted. Now, in a warmer climate, it is erosion and deposition by running water, together with human activity, that further modifies our scenery.

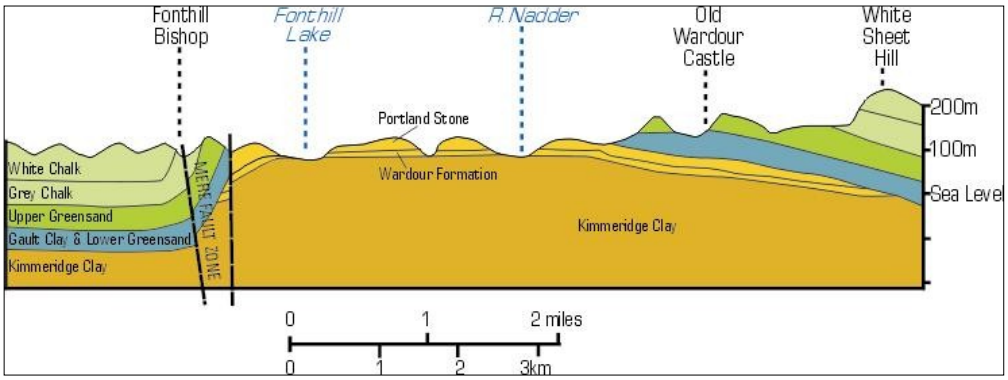
The nature and structure of the rock not only influences the shape of the land, but also the location of water, patterns of drainage and the development of soils. These in turn govern the vegetation and hence the wildlife that will inhabit an area. Human settlements are located where the landscape is of strategic value, where a combination of factors, such as shelter, defence, transport routes, water, fertile soils, minerals, fuel, building materials etc., has enabled people to live.

The huge range of landscapes and land uses across Britain is directly attributable to the extraordinary variety of rock types found on these small islands. Every major period of geological time is represented, spanning around three billion years of Earth history. This is our remarkable Earth heritage. It is hardly surprising that Britain became the home of the modern science of geology. Legendary early workers of the 18th and 19th centuries, such as James Hutton, Charles Lyell and William Smith had an accessible field laboratory all around them, where they could observe and map different rocks, and comprehend the scale of geological time.

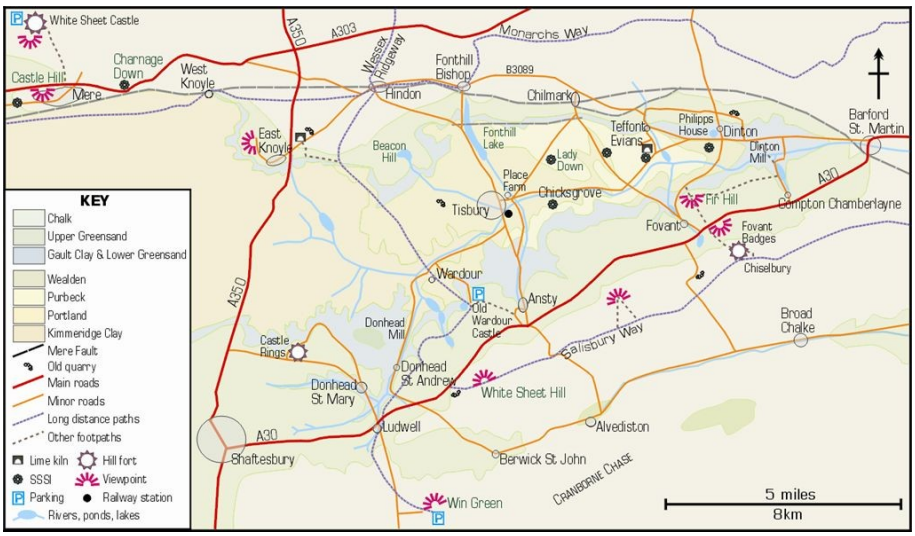
Our most outstanding geological sites receive statutory protection as *Sites of Special Scientific Interest* (managed by *Natural England,* who provide a list at http://www.sssi.naturalengland.org.uk/special/sssi/search.cfm)but there are thousands of other sites of sufficient interest to warrant recognition, designated as *Local Geological Sites* and listed at county records centres. Across the country there are county-based, geoconservation groups that work to record, protect, conserve, and where appropriate, promote these sites of geological interest. Some of the most active of these groups come together as a central organisation known as *The Geology Trusts*.

These groups have produced an ever-increasing number of trail guides, listed on the Geology Trusts website (http://www.thegeologytrusts.org/pub/resources/publications-products/). Many of these will be of interest, providing a new slant and adding interest to days out. For instance, different parts of the wonderful Wessex Ridgeway, running from the Marlborough Downs to the Dorset coast, are included in Wiltshire's *Explore the Landscape of the Vale of Wardour* and *Explore the Landscape around the Westbury White Horse,* while Herefordshire & Worcestershire Earth Heritage Trust's *Geopark Way* describes the109-mile long distance walking trail from Bridgnorth to Gloucester, with fascinating geology and spectacular landscapes, not to mention their series of 26 *'Explore'* trail guides and two *Discovery Guides* interpreting areas across the two counties.

A short section of the Wessex Ridgeway as it descends from Cranborne Chase at Win Green to cross the **Vale of Wardour** before rising again to Hindon in the West Wiltshire



Cross-section showing the geology of the Vale of Wardour



The Vale of Wardour, crossed by the Wessex Ridgeway

Downs is a perfect example of how the underlying rocks affect landscape.

It is remarkable to realise that the very existence of the Vale of Wardour in southwest Wiltshire is due to the collision in the Mediterranean region of Africa with Europe. This produced the Alps some 60 million years ago, as seafloor sediments (now rock), were forced up and deformed, with folds and faults extending as far as England. The rocks fractured where they were bent, weakening them. Over the years streams and rivers, exploited the cracks, following the line of one such fold and cutting through the higher Chalk and Greensand to reveal Jurassic rocks in the heart of the vale. The Chalk thus forms the rounded hills of the downs along either side, with the Greensand below producing ridges either side of the valley of the River Nadder, flowing from its source in the Greensand hills near Shaftesbury to cross Jurassic limestones, sandstones and clays as it makes its way eastward towards its confluence with the Wylye near Salisbury.

Win Green's tree clump

Win Green, at 277 metres, stands sentinel over the vale's entrance above the source of the Nadder in the Greensand hills east of Shaftesbury.

The dramatic views are typical of the chalk downs. There are terracettes, 'sheep tracks' on the steep slopes, simply the result of soil moving downhill over the millennia. Dry valleys are reminders of the Ice Age, when permafrost rendered the normally porous chalk impermeable. Water could no longer penetrate; instead, streams cut steep valleys during seasonal thaws. Eventually 10,000 years ago as the ice retreated to the Pole,

Ludwell's watercress beds fed by springs

rainwater was again able to sink through, leaving the valleys dry. Rainwater now continues its downward passage into the underlying Greensand, but beneath all this is an impermeable barrier of clay, up to 50 metres thick, so a reservoir of groundwater builds up, with springs where it reaches the surface. Such springs supply watercress beds at **Ludwell**. Spring-line villages grew up all along the Greensand outcrop. A detour to **Donhead St Mary** is rewarded with a hidden gem of a church and **Donhead St Andrew** has a fine old mill using water from the River Nadder. The local Greensand stone is prominent in the houses, giving a special charm to the villages. It gets its name from the green-

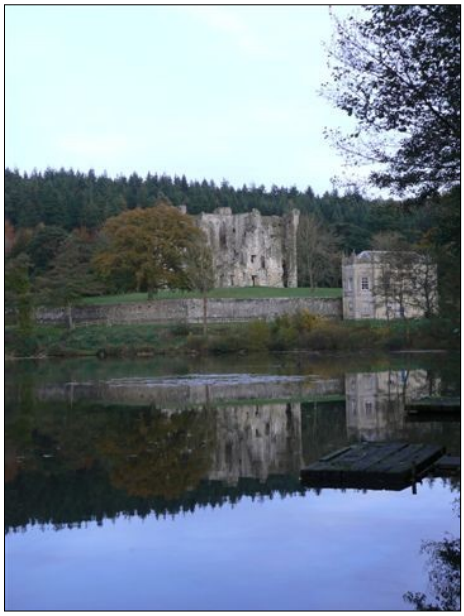
Donhead St Mary Church & Donhead Mill are built with local Greensand

grey colour produced by glauconite, a dark green mineral scattered through the sand; it can only form in seawater, proof of the marine origins of the sandstone, along with fossil shells. The wooded Greensand hills along the south edge of the vale form a broad ridge.

The 14th C **Old Wardour Castle**, destroyed in the Civil War, can be explored, courtesy of *English Heritage*. Its situation near the base of the Greensand allowed the fishponds built below the walls to retain water. Clay underlies all the flat area beneath the Greensand ridges. The surrounding old castle walls are mostly built of Greensand but the castle itself is made of the more up-market Chilmark Stone that has a pale, finer look and withstands weathering better. The latter rock is older, belonging to The Jurassic Portland Stone Formation.

This level of geology is reached in the Nadder valley by the time you get to **New Wardour Castle** just a mile away – the grand 18th C mansion (privately owned) was built to replace the old castle now left as a romantic ruin. quarried certainly since medieval times,

New Wardour Castle uses Chilmark Stone



Old Wardour Castle backed by Greensand hills

adding to the distinctive character of the villages around here. It is to be found in the most prestigious buildings throughout the vale, as well as around windows, doors and on corners, in houses made of Greensand or brick. Cathedrals from Salisbury to Rochester have used it, but stone extraction reached a peak in the 19th C when there were over 40 quarries. The Jurassic rocks are seafloor deposits from 150 million years ago. Imagine the sub-tropical seas here, at a time before Europe had drifted north to present latitudes.

As the path crosses to the northern side of the vale, the geology is the mirror image of that to the south, except that where the rocks dip more steeply, it is the Greensand, here up to 75 metres thick, that forms the most prominent features from West Knoyle to Dinton (rather

than the Chalk). The Greensand's chert content is what makes it hard here, where it forms ridges rising to around 200 metres, given over to woodland because of the steep slopes and acid soils. After burial on the seafloor, the sand became cemented by very finely crystalline silica, called chert, originally from the skeletons of sponges and certain plankton, as well as by calcium carbonate from shells.

The Chalk, being a relatively soft rock, is not found much in buildings where there is an alternative available. However, quarrying was widespread on the downs, as chalk was needed for mortar, agricultural lime and for cob walls. So although by the time you get to **Hindon**, you are back on the Chalk again, the only indication is in the occasional garden wall.

The village street was rebuilt after a fire in the 18th century using Chilmark Stone.

The Wessex Ridgeway, the White Horse Trail, the Monarch's Way, the Macmillan Way….. These are just a few Wiltshire examples of footpaths explored by The Geology Trusts members' landscape & geology guides.

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Explore the Landscape of the Vale of Wardour is available from Shaftesbury Tourist Information Centre, Tisbury Post Office and online from www.thematic-trails.org

Explore the Landscape of the Vale of Wardour

The Building Stones around Wells Cathedral

Elizabeth Devon

Figure 1 Wells Cathedral

As part of 2012 Mendip Rocks, David Rowley who teaches at Wells Cathedral School, gave us a splendid insight into the building materials used around the Cathedral and the Cathedral Green. We met in the lecture room of Wells and Mendip Museum where David introduced 'A story in stone'. He explained that the wide variety of rocks we would see were all derived within 10km or so from Wells and tell a story of environments as different as coral reefs and deserts. All the rocks occurred over a timespan of 250 million years, dating from those of Devonian age (416 million years old) to those of Jurassic age (145 million years old). All the rocks we were about to see are sedimentary, i.e. they are made from sediments weathered and eroded from somewhere else (second-hand rocks) or they formed directly in the sea from the remains of fossils. These sediments become buried, compacted and cemented into hard rock over time. David put some sand grains with a little water into a cut-off plastic syringe and demonstrated how sand grains cannot be cemented together by plain water but when some sort of cement is added (in this case calcium sulfate or plaster of Paris) the result is a hard 'pellet' of rock which can be tested for strength.

Our first stop when we left the Museum was at