

Watlington Environment Group - February 2019

Geology of Oxfordshire and Watlington by Christine Whittingham.

Imagine, if you can, a 200 million year period, during which the land beneath your feet has moved from a position much closer to the equator; where there have been periods under the sea where non-organic material eroded from adjacent land-masses and organic material from creatures living in the sea has fallen to the bottom; where there have been periods above the sea where these erosion processes from rain, wind and ice have removed material; where previously horizontal layers have been tipped en masse by a few degrees; and a bit of folding thrown in for good measure. That is the complex but fascinating history of Oxfordshire's geology presented in Christine Whittingham's whistle-stop tour at our February meeting.

The process of tipping has the lucky effect that the different layers are exposed at the current surface as one traverses it laterally – draw yourself a quick sketch if this isn't immediately obvious - and for Oxfordshire, a transect from north-west to south-east moves from the oldest to the newest. As the talk took us on this journey, we learnt about the features of each rock-type; the conditions under which each was laid down and the creatures that lived there and are now often preserved in fossilised form; the building and other purposes each has been used for, and recommended locations to view the best examples.

With all these long- and short-term fluctuations in relative sea level (sometimes due to changes in ocean depth, sometimes due to land uplift), the end-result is unsurprisingly complex. Recognisable 'discontinuities' can indicate, for example, where there have been bays or estuaries; and the newest deposits have eroded to varying degrees, sometimes eroding away completely.

Some rock-types are impermeable to water, others are permeable and can hold water within them as aquifers, and where the boundary layers of the two types occur near the surface, underground water is forced to the surface as springs. Due to local discontinuities where a thin impermeable layer can interleave with a permeable one, one can get "perched watertables" and a complex stream and spring pattern – more about this in the November Watercourses Project talk.

The other key geological feature locally is, of course, the Chiltern Hills themselves. These are primarily formed from chalk, made up of the calcified remains of organisms that lived in particular marine conditions, with very little inorganic material. Chalk only forms in seas of a particular temperature, and, due to the solubility effects of pressure, only in sea depths of 50-100m. On the 'peaks', where seas were consequently shallower, sands and gravels formed, which in some cases still remain, mixed in with eroded chalk.

There is a considerable depth of chalk, but with several recognisable layers of slightly different composition within it, often separated by a narrow layer of impermeable rock. This indicates a considerable period of deposition, but with some jumps to very different conditions within that period. The different types of chalk vary in their resistance to erosion, and when the layers are tipped, this translates into slightly different gradients on the scarp slope which are visible on the ground. Although not

explicitly referred to in the talk, several sources suggest that the Chiltern ridge itself was formed as a peripheral fold at the edge of the Alpine uplift caused by a collision of tectonic plates.

Slightly frustratingly, our journey through time ended a good few thousands of years ago, and we only touched, during questions, on how many of today's visible features like dry valleys were formed. Perhaps a subject for another talk?

Despite it being a few years old (2005), Christine strongly recommends Philip Powell's book *The Geology of Oxfordshire*, and I would also like to draw your attention to the wealth of information on the British Geological Survey website www.bgs.ac.uk including a superb zoomable map of the geology of Britain.

MRC 14/04/19