THE GEOLOGY OF PANSHANGER PARK (1)

The River Mimram flowing through the park has cut into a sequence of two thick Quaternary Gravels over the Chalk. These are known as the Westmill Lower Gravel and Westmill Upper Gravel. They are separated by a thin layer of grey chalky clay known as the Ware Till (Fig. 1).

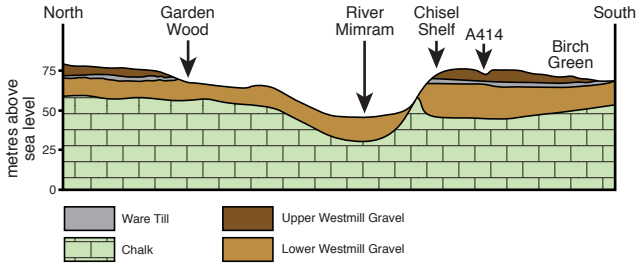

Fig. 1. North-south cross section of the Mimram Valley at Panshanger, showing Chalk, Westmill Lower Gravel (of proto-Thames), Ware Till and Westmill Upper Gravel (glacial outwash).

The Lower Westmill Gravel was deposited about 0.5 million years ago by the River Thames when it flowed north-eastwards across Hertfordshire into East Anglia and the North Sea (Fig. 2). It is composed almost entirely of flint pebbles derived ultimately from flint nodules in the Chalk of the Chilterns, but there are also a few quartz pebbles transported from much older rocks in the south Midlands and even Wales. Across Hertfordshire the Thames eroded WSW-ENE channels in the Chalk bedrock, leaving intervening ridges of Chalk. An especially narrow Chalk ridge has historically been quarried at two places in the Chisel Shelf woodland on the steep southern side of the Mimram Valley (Fig. 1). The gravel filling a large channel beneath the centre of the present Mimram Valley was previously quarried in several large pits. Because these disused gravel pits are close to the present watertable, they form the large lakes that are an excellent habitat for water birds and other aquatic wildlife.

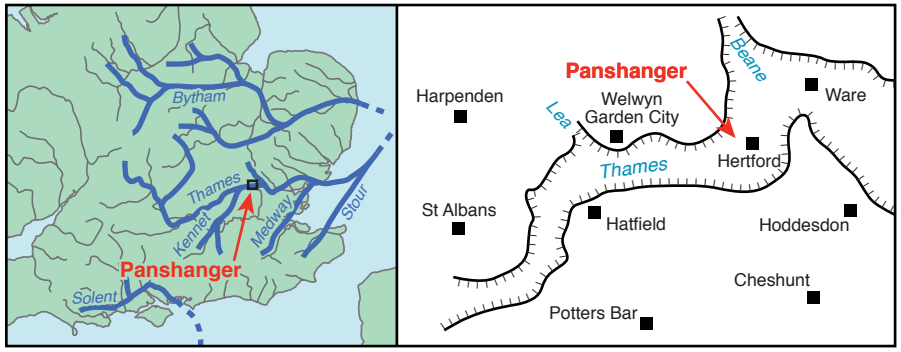

Fig. 2. Rivers of SE England 0.5 million years ago (in blue) (left) and extent of the proto-Thames Valley in the Panshanger area at the time of the Westmill Lower Gravel (right).

The Ware Till occurs higher up the valley sides and was deposited beneath a glacier that invaded north-east Hertfordshire from East Anglia during the Anglian Glaciation around 0.45 million years ago. It contains abundant fragments of chalk because the glacier had slowly traversed large areas of the Chalk outcrop in Lincolnshire, Norfolk and Suffolk (Fig. 3). However, the glacier must have originated even further north, because the till also contains far-travelled rocks (erratics) from northern England, southern Scotland and even Scandinavia. The grey clay matrix of the till was derived from bedrock clay formations in the East Midlands, some of which contain the mineral pyrite (FeS_2).

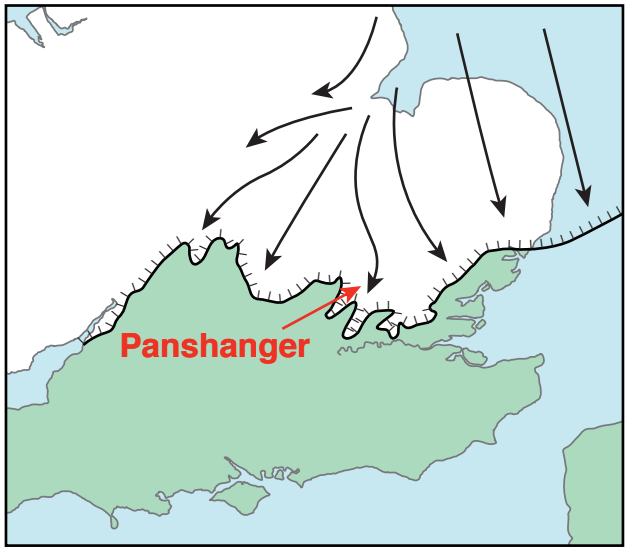

Fig. 3. Extent of the Anglian glacier and directions of ice movement in SE England about 0.45 million years ago in the Anglian glaciation.

The Upper Westmill Gravel forms the higher ground on either side of the Mimram Valley. It contains abundant chalk fragments, flint pebbles and the same range of erratics as the Ware Till, so it was deposited by water released from the Anglian ice sheet as it melted. The presence of chemically reactive minerals, such as chalk, pyrite and some of the other erratics, made the Upper Westmill Gravel less suitable for aggregate (e.g. production of concrete) than the Lower Westmill Gravel (dominantly inert flint).

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For more information about Hertfordshire geology

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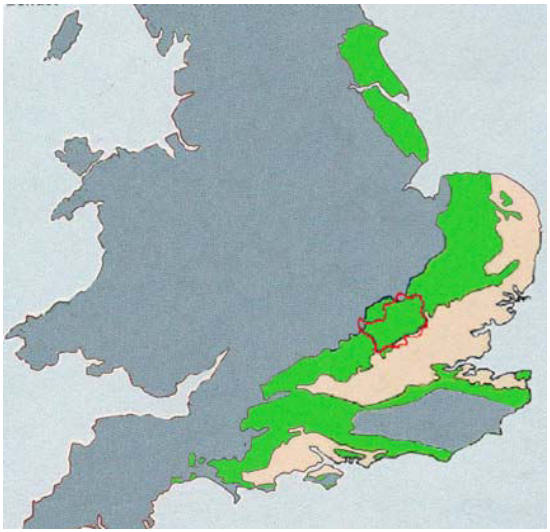
THE GEOLOGY OF PANSHANGER PARK (2)

Chalk was extracted from Panshanger and used with gravel for surfacing paths on the estate around 1880, in front of you is an old chalk pit dating from that time, but the story of chalk goes back much further than that.

It formed between about 100 and 80 million years ago when dinosaurs roamed the Earth, though not here because the land was covered by a warm clear sea when world temperatures and sea level were very high this is known as 'The Cretaceous Greenhouse'.



younger rocks

chalk

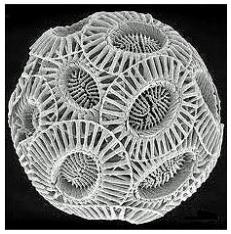
older rocks

Simplified geological map showing where chalk outcrops at or near the surface in southern Britain.

Much of the chalk has been eroded exposing older rocks. In parts of SE England it is buried beneath younger rocks. In most of Hertfordshire (outlined in red) the chalk is covered by gravels and clays.

Chalk (geologically a very fine limestone) is found in England, from the Wiltshire Downs to the White cliffs of Dover, to the Yorkshire coast, and in other countries including Russia, the American Midwest and Australia. By the end of the Cretaceous it was up to 400metres thick. In this area now it extends down about 175 metres to the older rocks beneath.

In some places chalk rock is hard enough to build with, but here it is soft and easily powdered. However there is more to the powder than meets the eye, most grains are fossils of minute algae called coccolithophores which formed shells of individual plates of calcium carbonate called coccoliths, arranged around them in a coccosphere. They lived in the surface waters and shed coccoliths as they renewed them during life, and when they died the coccospheres sank and most separated.



Scanning electron micrograph of a coccosphere
The diameter is about 0.016 of a millimetre (a row of about 1000 coccoliths would fit on a pin head)

Pick up a piece of chalk and imagine how many coccoliths you are holding, and how many are left on your fingers when you put the chalk down.
You can also find plenty of flint which formed chemically in the chalk from dissolved silica

Chalk also contains larger fossils, some made of flint but the chalk here is not as fossil rich as deeper down

Some fossils from the chalk **= 1 cm**

Spondylus (bivalve molluscs) ***Inoceramus***

Micraster (a sea urchin)

An ammonite

A sponge

A belemnite (similar to cuttlefish)

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