PRESENT

QUATERNARY 2.6 million years

TERTIARY

65 million years

CRETACEOUS

146 million years

JURASSIC

208 million years

TRIASSIC 245 million years

PERMIAN 290 million years

CARBON-IFEROUS 362 million years

DEVONIAN 408 million years

SILURIAN 439 million years

ORDOVICIAN 510 million years

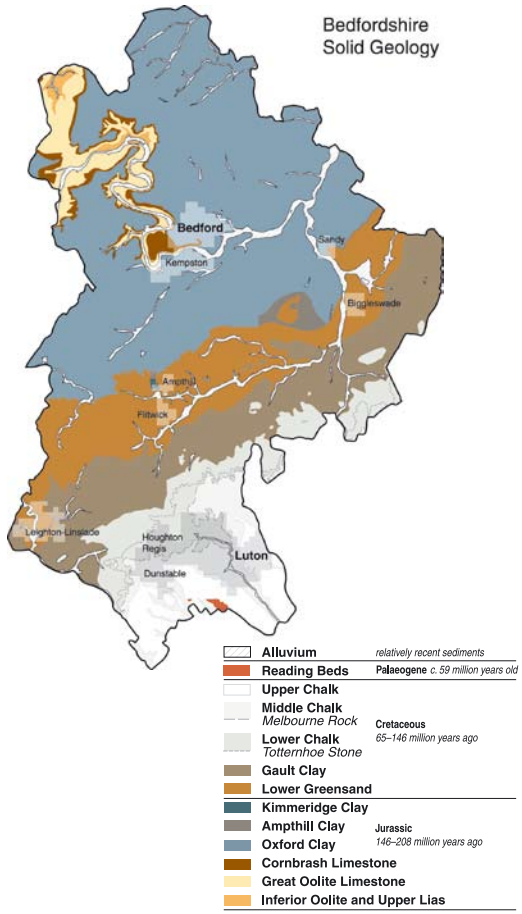
CAMBRIAN 570 million years

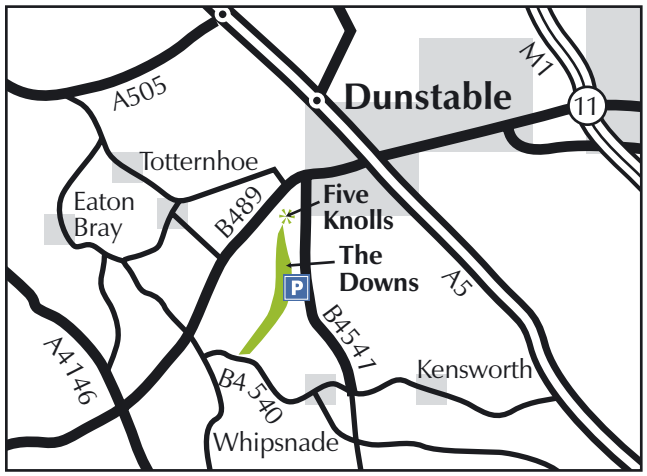
PRE-CAMBRIAN 4.6 billion years

Bedfordshire in the Bahamas

The rocks of Bedfordshire date from the early Jurassic to the Tertiary Period, about 190 to 40 million years ago. (The rocks laid down during the late Cretaceous and Tertiary are missing in our area, worn away by time and the glaciers of the Ice Age) All these rocks are made from many layers of sediments – limestones, clays and sands.

During the Jurassic and Cretaceous periods what is now Bedfordshire was at the latitude of the modern Bahamas. The Chalk that rises high in the south of the County was deposited on the floor of a warm tropical sea.





The Downs lie beside the B4541, south of Dunstable. Refreshments are available by the free parking.

The Bedfordshire & Luton Geology Group exists to encourage understanding of the geology and geomorphology of the county and to undertake site recording, interpretation, advice and education

Regionally Important Geological and Geomorphological Sites (RIGS) are places that reveal our geological past and are considered important enough to deserve conservation. They include sites where rocks can be seen (such as quarries and road cuttings) or where the geology or geological processes can be inferred from the shape of the landscape. Official RIGS are recognised by county councils and by Natural England.

For more information about the BLGG and our events as well as the geology and geomorphology of your area visit our website at

www.bedsrigs.org.uk

or contact Chris Andrew c/o Bedford Museum, Castle Lane, Bedford, Bedfordshire MK40 3XD. Tel: 01234 353323; Fax: 01234 273401

ENGLISH NATURE

Supported by English Nature through Defra's Aggregates Levy Sustainability Fund

Cretaceous Chalk: Dunstable & Whipsnade Downs

Bedfordshire & Luton Geology Group

bringing landscape to life

Looking southwest from Dunstable along the edge of the Downs to Ivinghoe Beacon Hill

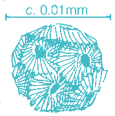
Come for a walk through time.

The green slopes of the chalk escarpment offer spectacular views over the clay vale to the north, but this peaceful and pleasant landscape was sculpted by a dramatic past. Amazing things happen on the geological timescale.

Bedfordshire before the Chalk

The Downs did not exist 115 million years ago. A narrow seaway had recently burst across England from the Wash to the Isle of Wight, depositing the sands that were to become the Greensand Ridge (visit www.bedsrigs.org for more information about the Lower Greensand). As sea levels continued to rise, driven by massive global warming, the sands of the shallows were followed by sediments of deeper water: the Gault Clay. The Lower Greensand and Gault Clay are softer than Chalk, and have been eroded to create the low sand ridge and clay vale to the north of the Downs.

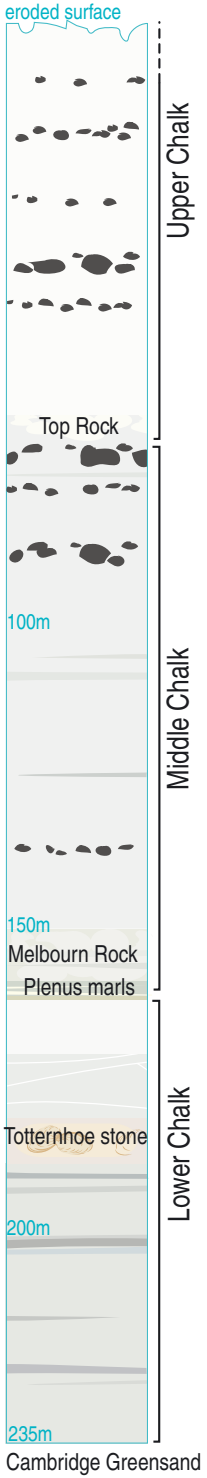
The formation of the Chalk



As global temperature and sea level rose, microscopic algae known as *coccolithophores* began to thrive in the warm water. Their skeletons rained down on the seafloor, adding calcium carbonate – chalk – to the clays washed from the retreating land. This chalky clay is the now the Lower Chalk, a soft pale grey to cream deposit at the foot of the Downs. The sea rose higher, reaching more than 300m above current levels and, as the water deepened, the harder, purer limestones of the Middle and Upper Chalk were deposited. These layers are roughly 5% clay and 95% calcium carbonate, the fossil skeletons of algae so small that thousands would fit on the head of a pin – and in this area the Chalk was well over 255m thick!

Flints are fossils, too…

Found from the top of the Middle Chalk and in layers throughout the Upper Chalk, black, shiny flint is *microcrystalline silica* (a form of quartz). Sometimes when an animal died, silica dissolved in the sea-water precipitated, coating the remains in a gel that hardened quite quickly, preserving the shape of the animal as a flint. Most flints were sponges, hence the odd shapes.



The sea recedes

Temperature and sea levels began to fall 65 million years ago but due to erosion evidence of this is hard to find in England. During the Tertiary period the forces that raised the Alps created a ridge in the Chalk. Most of this ridge has eroded away, leaving the sharp escarpment and gentle southerly slope of the Chilterns. The Reading Beds, remnants of Eocene sediments found south of Hemel Hempstead, tell us Bedfordshire was dry land for much of this time, although it was also briefly a river estuary and submerged by the sea at least once.

The big freeze

Three million years ago the Downs would have been higher than they are today, and the clay vale to the north did not exist. As the world grew colder ice sheets formed in the far north. Half a million years ago, during the Anglian glaciation, an ice sheet flowing from Scandinavia completely covered Bedfordshire. Repeated freezing and thawing broke up the rock nearest the surface. Some of the fragments were removed by the ice, but much was washed into rivers to become what we see as glacial sands, and gravels. Flowing water also carved valleys into the Chalk. These are now *dry valleys*, as water only runs over the surface when the chalk is frozen. Today rain simply soaks into the porous chalk to become groundwater. It then flows along the top of the impermeable Lower Chalk to emerge at springs at the base of the hills.

Look at a chalk cliff or quarry face (there are good exposures near Totternhoe) and you can see layers marking different environmental conditions in the sea at the time it was deposited. Some, such as the Plenus marls, are named for the fossils found there. Others are named for the areas where they are most noticeable.

Five Knolls, Dunstable. The mounds were much higher when they were raised 4000 years ago

People shape the Downs

Sculpted into the form we see today, the Downs became a very important landscape for people. The prehistoric Icknield Way (used for at least 6,500 years) runs from Wiltshire to Norfolk along the high, relatively dry Chalk escarpment. Tombs at the edge of the Chalk such as the group of Bronze Age round barrows at Five Knolls were visible for many miles.

The thin soils that form on Chalk were easily cleared of trees, but could not sustain arable cropping. The beautiful flower-rich chalk grassland developed in response to centuries of grazing by sheep. Some areas were set aside as *warrens* to raise rabbits, a very valuable animal when it was brought to Britain by the Normans. From time to time, as food became short, farmers would try to raise crops on the steep hillsides, but soon the crops would fail and only the narrow terraces following the contours, known as *strip lynchets*, remained. All these features make the Downs more interesting to us today. The Chalk itself supports modern industries, too, as it is quarried for cement, whiting, lime and for building stone.

Fossil sea urchins, sponges and shells found in the Chalk are a reminder that this high slope formed at the bottom of the sea.