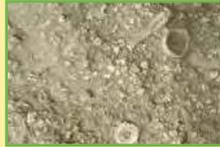


Rocks along the trail

Sedimentary rocks are made up of particles deposited in layers. They usually form on the sea floor, in lakes and rivers, or in deserts. The sediment layers are compacted and consolidated by the weight of overlying material. The particles within the layers can also be cemented together by minerals (e.g. iron) carried by water percolating through the sediments. Eventually, over millions of years, the compressed sediments become rock.

Limestone is composed primarily of the mineral calcite and is a very variable group of rocks. The hard, fossil rich limestone along the trail formed in a warm shallow sea.



Shale is composed of millions of tiny fragment of material. This material was deposited in layers on the sea floor.



Sandstone is composed of broken fragments of older rocks. The fragments of rock range between 0.05mm and 2mm in diameter.



Mudstone is composed of particles less than 0.05mm in diameter (too small to be seen with naked eye). The particles were deposited rapidly collecting in a jumbled fashion (unlike shale).



Igneous rocks are formed when magma (molten rock) cools and solidifies. They can either be intrusive: form beneath the earth's surface, or extrusive: when the molten material comes to the surface and forms a volcano for example.

Granite is a coarse grained rock containing the minerals quartz, feldspar and mica. The granite seen along the trail is particularly rich in feldspar giving it its distinctive pink colour.



Diorite is a coarse grained rock containing the minerals quartz, feldspar and mica and a high proportion of mafic (dark) minerals.



The Abberley and Malvern Hills Geopark

...is one of a new generation of landscape designations that have been created specifically for the interest of the geology and scenery within a particular area.

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The Geopark Way

...winds its way for 109 miles through the Abberley and Malvern Hills Geopark from Bridgnorth to Gloucester. The Geopark Way passes through delightful countryside as it explores 700 million years of the Earth's history.

Geopark Way Circular Trails ...

...form a series of walking trails that each incorporate a segment of the Geopark Way linear long distance trail.

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Geopark Way circular trail

Mathon and the Malvern Hills



A 9 mile circular geology & landscape trail



The rocks along the trail are split between ancient Precambrian, Silurian and Devonian aged rocks.

Precambrian aged rocks (4600-542 million years old)

The oldest rocks along the trail are a staggering 680 million years old. They make up the rocks of the Malvern Hills. Imagine that you were transported back 680 million years onto that piece of the Earth's crust which was to become today's Malvern Hills. You would have been in quite a different part of the world; about 60° south of the Equator, close to the Antarctic Circle. You would find yourself in a place of violent geological activity, amidst volcanic mountains and subject to frequent earthquakes as the rock around you slowly bent and buckled into a mountain chain. The rocks of the Malvern Hills developed from molten material produced during this episode of violent geological activity.

Silurian aged rocks (444 – 416 million years old)

During Silurian times this area lay about 30° south of the equator. To the east lay a continent, to the west beyond the Welsh Borders was a deep ocean. The earliest rocks from the Silurian age are thought to have formed from flash-flood events. Later, sediments laid down in shallow tropical waters, over time, would form into limestone and siltstone. By the late Silurian, sea levels started to fall as the continents either side of the ocean converged. Gradually the ocean disappeared to be replaced by a range of high mountains comprising what is now North Wales, the Lake District and Scotland. As these mountains eroded vast quantities of material was transported south by streams and rivers. These sediments formed into the rocks of the Raglan Mudstone Formation.



Artist's reconstruction of a Silurian sea

Devonian aged rocks (416–359 million years old)

During the Devonian hot, dry conditions prevailed. Coarse material was being eroded from the high mountains to the north-east of the area. This material was transported by, and deposited from, rivers onto the open plains of this area. This coarse material formed into the 'Old Red Sandstone'.

(cover photography reproduced by kind permission of John Stocks).

Start Point: Beacon Road Carpark, Malvern Hills

Grid Reference: GR SO 768 438

Ordnance Survey Map: Explorer 190

Parking: Beacon Road carparks

1) From the Lower Beacon Road carpark follow the metalled track gently uphill passing through the upper carpark before reaching a junction of paths marked by the 'Gold Mine' stone cairn. Continue heading uphill staying on the main track for around 600m until you reach the summit of the Worcestershire Beacon, which is marked by a beacon, cutting and a trig point.

The Malverns Complex

The Precambrian aged rocks of the Malvern Hills consist of igneous and metamorphic rocks collectively referred to as the Malverns Complex. The Malverns Complex formed beneath a volcanic island arc, a situation like that of the Pacific Rim today. Here, tectonic plates (part of the Earth's crust) collide and one plate is dragged under another along a subduction zone (diagram below). Intense heat and friction cause melting to form magma in the overlying rocks. Some of the magma reaches the surface to form volcanoes but if it solidifies deep within the crust, as with the Malvern rocks, it forms intrusive igneous rocks such as granite and diorite. The surface layers, and therefore the evidence of volcanoes, have subsequently been eroded away, leaving just the rocks seen in the boxed area of the diagram to form the Malvern Hills we see today.

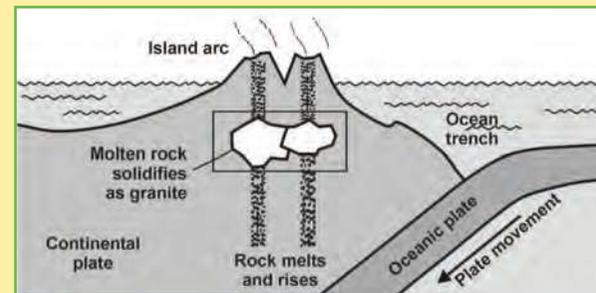


Diagram of a subduction zone

The vantage point from the Worcestershire Beacon illustrates the marked difference in the landscape to the east and west of the Hills. To the east is the Severn plain underlain by Triassic aged mudstones and sandstone (around 230 million years old). To the west, close to the Malverns, is a ridge and vale topography underlain by much older rocks which are Silurian in age. The Malvern Hills form a boundary between these two contrasting landscapes.

2) From the Beacon retrace your steps for 40m back down the track to a bench on your right. Here, turn sharp left onto a narrow path which is headed by a low stone sign pointing to North Hill and Great Malvern. Follow the path for 130m, crossing a number of rocky outcrops, to where the path splits. Stay on the wider upper path continuing gently downhill to a path junction. Turn right for 30m, then left, through a gap in the embankment, following the path downhill to a stone cairn.

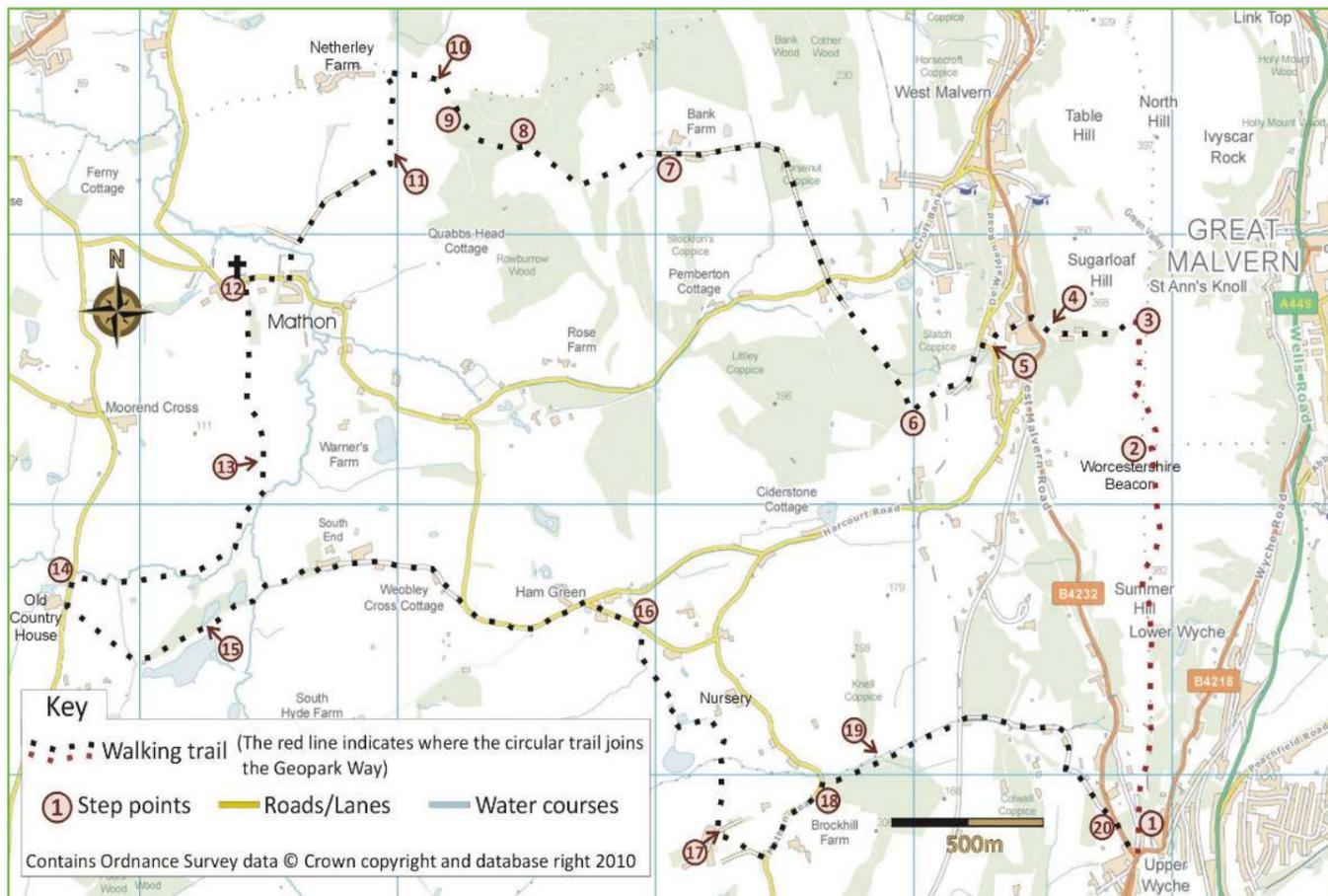
3) At the stone cairn, face west and walk in the direction of the 'West Malvern' arrow along a gravelled track for 15m to where the path splits. Follow the right hand path for 15m then turn sharp left down a narrow joiner path. Then turn right down a narrow downhill path which leads to a drive outside a number of hillside properties. Continue along the drive for 150m to quarry on your right.

The quarry is predominantly composed of the rock diorite. Distinctive pink, granitic intrusions cut across the quarry face. The crystal size in these intrusions can be in excess of 20mm indicating that they cooled very slowly. A dolerite (another dark igneous rock type) intrusion can be seen forming the step between the upper and lower levels of the quarry. Do not climb between the levels. The hard Malverns Complex rock was extracted from here and numerous other quarries along the Malvern Hills for use as aggregate. Malvern Stone was much sought after at the turn of the 20th century, because of its exceptional hardness which made it suitable for use in road building.

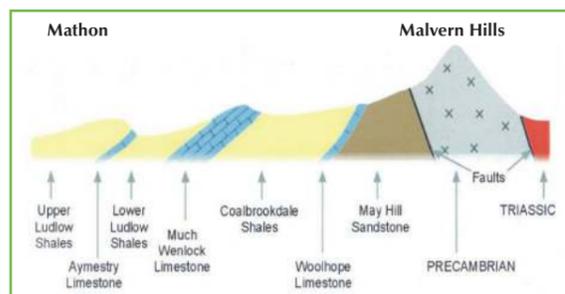
4) From the quarry continue downhill to the road. Carefully cross the road and continue straight ahead following the sign to the 'Brewers Arms' pub. Pass the pub and a number of properties and onto a grassy area. Follow the path as it zig-zags downhill to a drive. Turn right and walk to the lane.

Having left the Malvern Hills behind you, you have stepped onto ground underlain by Silurian aged rocks. Between here and step 12 you will walk over the succession of rock units that collectively make up the Silurian period of time, finishing just before step 12 on the youngest rocks of the period the Raglan Mudstone Formation.

Though there are limited outcrops of rocks to examine along the pathways, the landscape along this section of the trail is undeniably one underlain by a Silurian succession of rocks typical of this area. Ridges of hard limestone and/or sandstone alternate with sculpted vales underlain by softer shale, resulting in a striking landscape.



The diagram below illustrates how these units of alternating rock types have been tilted from their original horizontal position.



A cross section illustrating the Silurian sequence between the Malvern Hills and Matheron

5) Turn right along the lane for 50m, and then turn left onto Blackheath Way. Follow this drive for around 300m to a waymarker post on your right (opposite 'The Croft'). Turn right onto the path and walk onto a stile. Go over the stile and follow the clearly marked path across the field exiting through a kissing gate.

6) Turn right following the wide wood lined track to reach a metalled drive and onto a lane. Cross over the lane and continue ahead along the metalled drive for 900m to reach Bank Farm at the end of the track.

7) At Bank Farm (which has a faded sign) follow the track round to the left and onto the rust iron coloured gate with a 'Footpath only - no horses, bikes or vehicles' sign on it. Go through the gate following the wide track ahead uphill. The landscape on either side of the track here is stunning with a variety of valley shapes and forms present. Upon reaching where the track bends sharply to the right fantastic views open up over the local landscape. Through the narrow valley Oyster Hill is visible. Follow the track around to the right before eventually entering woodland.

8) Into the woods, follow the main track around to the left and on for 200m to a waymarker post on the right. Turn right onto the path following it out of the woods and into a field where views open up across the Malvern Valley (refer to text box in right hand column).

9) Follow the field boundary on your right steeply downhill. Where the field boundary cuts to the right continue straight ahead. Just before you drop down to the fenceline turn around to find a rock exposure under a tree.

The rocks exposed here are Silurian aged calcareous siltstone approximately 420 million years old. Within the siltstone are numerous hard calcareous nodules.

10) Turn left at the fenceline along the sunken path to join a track. Just before reaching Netherley Hall follow the track to the left and on for 300m to a quarry on the left.

This quarry, like so many in the immediate area, extracted limestone and siltstone for use as aggregate on local tracks. The age of the rocks in the quarry match those at the tree exposure, yet there is a greater diversity of rock types present here, all of which would have been laid down in the Silurian warm tropical sea. Calcareous siltstones dominate, alongside layers of limestone, shale and mudstone.

The layers of rock in the quarry are steeply tilted rather than being horizontal as when they originally formed. Throughout their geological history these rocks have experienced lengthy periods when extraordinary compressive forces were placed upon them causing the rock to buckle, fold, tear and be uplifted, resulting in their current day form.

11) With your back to the quarry face, go over the stile and into a field. Cross the field, down a set of steps, a stile and onto a drive. Follow the drive downhill. You now walk over the youngest Silurian rocks, the Raglan mudstones. You may notice that the soil colour has changed from grey (from by the quarry) to red. After 400m turn left onto a path. Cross the footbridge over the brook and follow the path ahead to the road. Turn right and head to Matheron Church.

St John the Baptist Church

Matheron parish church dates back to the 11th century. The tower was added in the 15th century and porch shortly after. The church sits on ground underlain by Devonian aged Old Red Sandstone (416 to 359 million years old).

The church is built with an eclectic mix of local stone, the vast majority of which being rubble stone (photo 1) with ashlar blocks only really being used in the quoins and the tower buttresses.

The building stone used is predominately flaggy, dark red, Old Red Sandstone (photo 2 showing current bedding structures). However not all Old Red Sandstones are red! Green, buff and yellow varieties can be seen in the church walls. Nor are they sandstones (photo 3 showing a calcareous conglomerate - church porch). Also thrown into the building stone mix are a wide variety of Precambrian aged Malverns Complex rocks (photo 4). A Jurassic aged Cotswold Stone window lintel and surround (photo 5 showing fossil layer within the stone) and the occasional block of bright orange Triassic aged sandstone have also been used for good measure.



12) From the church cross over the road, go through the car park, then a gate and along a wide track for 800m to a signposted path junction. Go over the stile ahead onto a field. Follow the field boundary on your left around the field and then down to a stile. You now stand in the Colwall Valley (refer to text box in next column).

13) Go over the stile and cross the field, heading to the footbridge. Do not cross the bridge, instead turn right following first the course of the stream and then the field boundary upto a kissing gate. Go through the gate, turn left and follow the field boundary for 350m to a footbridge. Cross the bridge, then a stile into a field. Turn right and follow the field boundary around to a gate. Go through the gate, over the stream, and follow the field boundary on your right exiting the field through a kissing gate onto a lane.

14) Turn left along the lane for 100m to 'Old Country House'. Turn left and go through a gate into an orchard. Walk straight ahead following the waymarkers on the trees. Cross the gravelled track and continue to follow the waymarkers. Exit the orchard over a stile into a field. Turn left along the raised path, pass the property on your right and go into the woods. Follow the path ahead to a set of steps. Up the steps and then onto and up another set, continue along the path for 30m to where, on your right, you get a clear view across the lake on the other side of the fence.

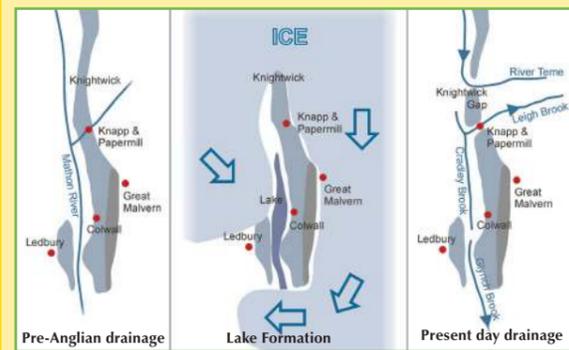
The Matheron River and Colwall Valley

A substantial river once flowed south on the western side of the Malvern Hills ridgeline. This river, the Matheron River, is long gone but the wide river valley that it created, the Colwall Valley, is a landscape feature of today. The sand and gravel deposited from the Matheron River together with younger river, lake and glacier deposits found in the area represent the fluctuations between glacial and interglacial conditions over the last 450,000 years.

The coarse and sandy gravels deposited from the Matheron River contain a high percentage of material from the local area: Silurian limestones and Malverns Complex rocks, together with clasts from further afield, including Bunter Pebbles, coal debris, Longmyndian volcanoclastic sandstones (from the church Stretton area) and Jurassic fossils.

It was around 450,000 years ago that the Anglian Ice sheet, advancing from Wales and terminating near the Malvern Hills, blocked the Matheron River and formed a glacial lake in the Colwall Valley. Deposits of clays and silts observed in Matheron record this event.

When the ice finally melted, it left a changed river system. With the Matheron River no longer draining the area, the Cradley Brook developed flowing northwards towards the Leigh Brook, Alfrick, and onto join the River Teme.



The gravels and sands left behind by the Matheron River have been extracted from several pits across Matheron for use as aggregate. Extensive extraction took place in the 1980s and 1990s, but extraction, in smaller pits, dates back to at least the 1890s. The lake behind the fence and the shallows to the left of the path are all former extraction pits which were in operation during the late 20th century.

15) Continue along the path through the woods exiting over a stile into a field. Follow the course of the Cradley Brook to a footbridge. Cross the bridge, go through a 2nd field and across another footbridge. Turn left up the bank and then right along the field boundary to a stile. Go over the stile and follow the path around to a stile next to 'Tan House'. Turn right and follow the drive to join a lane and on to a road junction. Continue ahead along the lane for 500m. Just after passing a post box, at the junction, follow the lane to the right signed to Colwall. After 200m, turn right at the fingerpost.

16) Go through the kissing gate, turn left and walk to a metal kissing gate. Through the gate follow the field boundary on your right for 270m to a stile. Go over the stile, turn left along the path, then veer left along the rubble track and then on to the raised bank above the lake. Follow the fenceline around to the end. Turn right and then right again to a footbridge on your left. Go over the footbridge and into a field. Walk straight ahead across the field heading for the middle of the farm building visible at the far end of the field. Exit the field via a gate into the yard.

17) Walk across the main track. Go through the gate ahead, to the right of the barn. Bear left across the field aiming for a gate roughly half way along the length of the field. Go through the gate, turn left and onto the lane. Turn left and follow the lane for around 350m turning right at the fingerpost into the Purlieu.

18) Follow the track ahead through the woods with the brook on your left. Initially on the right hand side of the path are a number of small shale and limestone (Silurian aged) quarries. Continue to where you cross a tributary stream joining from your right.

The waters of the tributary stream flow from the Malvern Hills passing through Silurian aged limestone (Wenlock limestone) along a spring line, before emerging and flowing to join the brook here. As the waters pass through the limestone they dissolve some of the calcium carbonate held within the rock. Upon reaching the surface the calcium carbonate precipitates out of the water and accumulates on the stream bed as tufa deposits. Tufa is continually, yet slowly, being formed in this stream. It is a very delicate, light, cream coloured deposit.

19) Continue along the path passing a number of exposures of steeply dipping beds of Silurian aged shale in the brook bank, before reaching a metalled drive at a path junction. Immediately on your left is a small Geology and Landscape interpretation board detailing the geology of the ground around you. Cross over the junction and walk straight ahead on the metalled track as it climbs gradually uphill, eventually leading to the West Malvern Road.

20) Turn right along the road, and then left up Beacon Road, back onto the Malvern Hills and to the carpark.

The trail ends here