



Photographs from top left to bottom right: Stone wall, Ledbury, Herefordshire; Quayside, Arley, Worcestershire; Miners Memorial, Highley, Shropshire; Gloucester Cathedral, Gloucestershire.

There are many more buildings and other structures in the Abberley and Malvern Hills Geopark where natural stone has been used in construction. There is not the space here to include them but details can be found on our website where some trails can be freely downloaded.

www.Geopark.org.uk

For more information about other places to visit in the Geopark check out the 'Explore Geology and Landscape' and 'Places to Visit' pages.

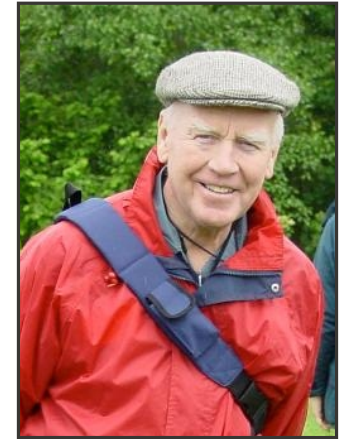


The Les Morris Memorial Trail

A 'Geology Wall' discovery guide across the
Abberley and Malvern Hills Geopark

Les Morris was a geographer and geologist who spent his working life as an educator. A wonderful man and founding member of the Geopark, Les had time for anyone interested in the formation and evolution of our planet and the landscapes upon it.

Les had a vision to bring this story to everyone by unlocking the vast store of our natural heritage tucked away in stone built walls.



Across the Geopark there are many different rocks varying in age from 10,000 years old to nearly 700 million years old. Many rocks have been used as building stones in the construction of important historical buildings and also in the building of simple local walls in houses, gardens and barns. They are an easy and accessible way to discover the wonders of rocks and the history of planet Earth.

This trail takes you across an area of 650 square miles from Bridgnorth to Gloucester, and Worcester to Hereford, and all places in between. Information about locations, geology and history is given on the following pages with locations generally running from north to south through the Geopark. All locations are accessible to the public and in most cases access is free of charge. Some will require a walk, others are adjacent to car parks, bus and train routes; many are close to visitor centres and cafes.

Can you find them? The Geopark information map inside will help you. Post codes and grid references are also given as a guide. Tick them off as you work through a geological history of 700 million years. At many locations you will be able to pick up a separate geology and building stones trail leaflet which will take you to new and interesting locations. There are also history trails to pick up in many towns.

Bridgnorth, Shropshire. The **old station building** of the Severn Valley Railway was constructed in 1864 as part of the route from Hartlebury to Ironbridge. The building is made from a grey sandstone (S) sourced locally from Grinshill near Shrewsbury. The rock was formed in river channels during the Triassic period. *There is also a train ride geology trail leaflet available at the station.* (WV16 4AE / SO716926)

Bridgnorth, Shropshire. The leaning **Castle** ruins are the result of undermining in 1664 by the Roundheads during the Civil War. The ruins provide a close up view of lots of different coloured sandstones (S). The red sandstones are Permian in age and were probably quarried locally. The grey sandstones belong to the Carboniferous period and were probably quarried near Highley and transported up the River Severn. *The Castle marks the starting point of the 109 mile long Geopark Way walking trail.* (WV16 4AD / SO717928)

Dudmaston, Shropshire. The short **orchard boundary wall** in this National Trust Estate has many different sandstones (S) to view. They are of Carboniferous and Permian ages and are of different shades of grey and red. Look out for rocks with fine layers known as laminations; rocks with small pebbles - conglomerates; and dark red (almost black) encrustations of iron ore - haematite. *There is a short geological trail around the stable yard - ask for a leaflet. There is a charge for entry. Check opening times.* (WV15 6QN / SO751887)

Alveley, Shropshire. Severn Valley Country Park was created in the 1980s by the restoration of the waste tips of the old Alveley Colliery. Near to the visitor centre is a large **grindstone** made of red sandstone (S). The rock was formed in river channels during the Carboniferous period. During the 19th century there was a significant local quarrying industry especially producing grindstones and building stones. *There is a geology trail leaflet available at the visitor centre. Check opening times.* (WV15 6HG / SO753839)

GEOLOGICAL TIME SCALE

*(Start of periods of time in
millions of years ago)*

1.6	Quaternary
23	Neogene
65	Paleogene
142	Cretaceous
205	Jurassic
248	Triassic
290	Permian
354	Carboniferous
417	Devonian
443	Silurian
495	Ordovician
545	Cambrian
4600	Precambrian

Hereford. The **cathedral** provides a wonderful set of walls of stone. The bulk of the building is made of red sandstone (S) of Devonian age. At the time of the formation of this rock Britain was south of the equator and part of a semi arid environment which was also subject to extensive meandering river systems. It was sand in these rivers that provided the material that eventually became rock. The stone used in the construction of the cathedral was sourced from quarries along the River Wye and transported by barge. (HR1 2NG / SO509397)

Hereford. The **Museum** on Broad Street is close to the cathedral. Here many different rocks have been used in the construction of this Victorian building. In particular look at the four ground level pillars built of Triassic rock. The sedimentary rock here is made up of very coarse fragments indicating formation during flash floods and rapid erosion. *There is a town geology trail leaflet available to purchase in the Tourist Information Centre.* (HR4 9AU / SO509398)

Ross on Wye, Herefordshire. Edde Cross Street carpark near the town centre has a **perimeter wall** with some wonderful stones to observe. Look out for rocks with fossil shells, ripple marks and sandstones with small pebbles. *Much more about the rocks and landscapes of the town is to be found in the geology trail leaflet which can be purchased locally.* (HR9 7BZ / SO595423)

Gloucester. The building of the **cathedral** was begun in 1089 although a Saxon abbey was here before then. The cathedral is largely built of Cotswold Stone - a Jurassic limestone (S) quarried nearby at Painswick. Inside the cathedral many different rocks have been used for memorials and tombs. Look out for the **tomb of King Edward II** which is carved from the mineral Alabaster. This is a soft material similar to gypsum which is used extensively in stone carving. (GL1 2LR / SO831188)

Gloucester. Just to the north of the Cathedral Cloisters, in the cathedral precincts, is Miller's Green. Here stands a **rough mill wall** with a variety of stones from different sources - yellow Jurassic oolitic limestone (S), blue-grey Jurassic Lias Limestone (S); and green Silurian sandstone (S) and red Devonian sandstone (S) both from the Forest of Dean. *To learn more find a copy of the booklet 'Gloucester in Stone' which is available to buy locally.* (GL12LZ / SO830188)

FOSSILS are the record of ancient life, animals or plants, left behind in sedimentary rocks. The fossil seldom preserves actual material from the organism, such as original shell material, but the shape of the organism may be preserved by minerals which have replaced the organic material. Fossils are very useful in helping to determine the environment at the time of deposition.

Upper Colwall, Herefordshire. The Malvern Hills GeoCentre is located a short distance from the Wyche cutting at the top of the Malvern Hills. Examples of rocks to be found in the area are on display in the GeoCentre. These rocks were intruded deep within the Earth's crust during the Precambrian period when Britain was located at the south pole. *A great deal of information about these and other rocks of the area is available inside the cafe (closed on Wednesdays). It is a great place to find out more about the Geopark.* (WR13 6PL / SO767435)

Colwall Green, Herefordshire. A short walk from the Green up Evendine Lane, will take you to some **stone built barns** that mark the edge of the lane. The walls of these buildings are made of a rock known as Wenlock Limestone (S). The stone was sourced from the lower slopes of the nearby Malvern Hills. It is Silurian in age and is noted for its abundant fossils. Look carefully and see how many you can find. They all indicate a shallow tropical sea when Britain lay just south of the equator. (WR13 6DT / SO755412)

Ledbury, Herefordshire. The church of **St Michael and All Angels** in its lovely location at the end of Church Lane was largely built in the 14th and 15th centuries. It is noted for its separate tower built in the early 13th century of Silurian sandstone (S). The main church building is made of red Devonian sandstone (S). *Call in the Heritage Centre for more information. Check opening times.* (HR8 1PN / SO712377)

Ledbury, Herefordshire. The **Alms Houses** form an impressive building in High Street. They are made from local Wenlock Limestone (S) and careful inspection will reveal lots of fossils. These fossils are the remains of the shells of organisms that lived in a shallow tropical sea much like the back reef environment of the Great Barrier Reef of Australia today. (HR8 1DS / SO710376)

Highley, Shropshire. The Severn Valley Railway visitor centre known as the Engine House is adjacent to the railway station. In the carpark leading up to the entrance is a **wall of gabions** filled with a dark grey igneous rock known as dolerite (I). This was formed during the Carboniferous period from molten rock intruded in to what is now the nearby Cleve Hills. *Check Engine House opening times.* (WV16 6NP / SO748828)

Highley, Shropshire. The **station buildings** of the Severn Valley Railway are constructed with grey-brown sandstone (S) formed in river deltas during the Carboniferous period. The stone known as Highley Sandstone was sourced locally from quarries which also supplied stone for the building of Worcester cathedral from the 11th century onwards. (WV16 6NU / SO749 830)

Highley, Shropshire. Severn Valley Country Park restored the old Highley Colliery (now adjacent to the Engine House). A short walk into the Park will take you past an impressive outcrop of grey green sandstone (S) of Carboniferous age. Walk to the **Miners Memorial** where large blocks of dark grey slate (M) have been erected. These are from north Wales and are of Silurian age. Look for tiny crystals of 'Fools Gold' (iron pyrites) in the slate. (WV16 6NP / SO746829)

(I) IGNEOUS ROCKS are formed when molten material (magma) rises from deep within the Earth. As it cools it solidifies to form igneous rock. When magma is forced into spaces in existing rocks it is known as an intrusive igneous rock. Examples are granite and dolerite. When the magma reaches the surface and forms a volcano it is known as an extrusive igneous rock. The lava basalt is an example.

(M) METAMORPHIC ROCKS. These are rocks that have been metamorphosed, altered by heat and/or pressure. The original rocks can be either sedimentary or igneous in origin. Some have been squeezed deep below the surface due to the movement of the plates that form the Earth's crust (e.g. slate and schist). Others have been heated and altered by magma as it is forced in to pre-existing rock (e.g. limestone changed to marble).

(S) SEDIMENTARY ROCKS are made up of particles deposited in layers. They usually form beneath the sea, in lakes and rivers or in deserts. The particles may become cemented together by specks of mud or new minerals such as iron or calcium carbonate. Over millions of years the sediments become rock.

Upper Arley Village, Worcestershire. The **quayside wall** is constructed of red Carboniferous Hextons Stone (S) which was quarried nearby. The rock was formed in an extensive network of channels as rivers meandered across wide flood plains. The same rock has been used to build **Hafren House** in 1842 just a few yards up the hill. And at the top of the hill **St Peter's Church** is predominantly made of the same stone. Local grey-brown Carboniferous Arley Stone (S) has been used in other buildings in the village including the largely lost Arley Castle which was built in 1843 and demolished in 1962. (DY12 1XB / SO765801)

Bodenham Arboretum, Worcestershire. The Arboretum has a number of different rocks on display amongst the wonderful specimen trees. Within the grounds and near to the barns is a short **dry-stone wall** constructed using Jurassic Cotswold Stone (S). This is a limestone and careful inspection of the stones will show tiny rounded grains known as ooliths as well as fragments of fossil shells. *There is a charge to enter the Arboretum but access to the café is free. Check opening times.* (DY11 5TB / SO807812)

Kidderminster, Worcestershire. An impressive building in the town centre, the **Town Hall**, was constructed in 1875. It has a facade of light brown sandstone known as Highley Sandstone (S). Also note the string of pinkish brown sandstone known as Hollington Stone (S). This latter stone is of Triassic age and was formed from sediment deposited in river channels at a time when Britain was near the equator. Hollington Stone is still quarried today in Staffordshire. *Town trail leaflets are available within the Town Hall.* (DY10 1DE / SO831765)

Bewdley, Worcestershire. The Guildhall, built in 1802, has an entrance to the Guildhall and Museum built of greenish grey Highley Sandstone (S). The stone was transported down the river Severn from the Highley quarries. It is Carboniferous in age and was formed in river deltas in a tropical climate. *A lot of additional information including a free geology trail is available in the Museum. There is also a town geology and building stones trail for sale in the Museum shop. Check opening times.* (DY12 2AE / SO786753)

Worcester. The **Hive library building** has a facade of grey sandstone (S). This rock is from the Forest of Dean and was formed in the Carboniferous period. It has layers of iron staining. Careful inspection will show that the sand grains are predominantly of the mineral quartz. The building is also the archive and archaeology centre for Worcestershire. *There is a free geology trail leaflet available at the Archive counter on the first floor.* (WR1 3PD / SO846551)

Worcester. The **Heart of Worcestershire College building** on the Deansway is built of greyish white Portland Stone (S). Walk along the front wall of the building and see that this rock, which is a Jurassic limestone, displays many fossils of oysters shells. *There is a city centre building stone trail leaflet for sale in the Tourist Information Centre in the city centre.* (WR1 2ES / SO849547)

Worcester. The **Cathedral** is a treasure trove of walls of stone, displaying a great variety of sedimentary rocks. You will also find igneous and metamorphic rocks there. One of the oldest walls in the Cathedral is in the cloisters where different coloured Carboniferous and Triassic sandstones (S) can be seen as part of the Norman construction. *There is a stone trail leaflet for sale in the Cathedral shop.* (WR1 2LA / SO849545)

Bromyard, Herefordshire. The National Trust property at Brockhampton Estate. At the heart of this 687 hectare farmed estate lies Lower Brockhampton Manor House, a romantic timber-framed house dating back to the late 14th century. The house is surrounded by a moat and is entered via a charming timber-framed gatehouse, built 1530-40. Look out for the sandstone (S) **wall of the bookshop**. All the stones are local and of Silurian and Devonian age. (WR6 5TB / SO684549)

Croome D'Abitot, Worcestershire. Croome Court on the National Trust Estate is a superb example of a building of Bath Stone - a Jurassic limestone (S). At the time of its formation Britain was in the tropics just north of the equator. The present building was constructed by Lancelot 'Capability' Brown. *There is an entry charge to the property.* (WR8 9DW / SO887451)

Hartlebury Castle and Museum, Worcestershire. The wall around the smaller car park is a wonderful mix of different sandstones (S). They are mainly red rocks of Triassic Age. The **Castle** is made of the same stone and all originally quarried in the village or close to it. The Castle was built in the mid 13th century as a fortified manor house. It was until recently the residence of the Bishop of Worcester. *There is a castle and museum geology trail available at the shop. There is a charge for entry to the Castle and Museum.* (DY11 7XB / SO836712)

Abberley, Worcestershire. This picturesque village has an outstanding Victorian church, St Mary's, which is made of Carboniferous brown sandstone (S). A careful look at the walls of the church will reveal bands of iron staining which were formed by precipitation from groundwater as the rock consolidated many millions of years ago. This iron staining of the sandstone is beautifully exposed in the walls inside the church. (DY6 6BP / SO751679)

Shelsley Beauchamp, Worcestershire. In this hamlet stands an impressive 14th century church, **All Saints**, with a tower of Triassic red sandstone. The rest of the church having been rebuilt in 1846 is made of red and brown sandstones (S) that were formed in the Devonian period and quarried locally in the Teme valley. (WR6 6RA / SO731628)

Shelsley Walsh, Worcestershire. Here you will find a small church, **St Andrew's**, with a Norman nave, and other buildings which are constructed almost entirely of a rock called tufa (S). This tufa was formed only 10,000 years ago in the Quaternary period and quarried locally along the valley of the River Teme where the rock is still being formed today. (WR6 6RP / SO721629)

Quaternary **TUFA** deposits can be found on the western side of the Teme valley. Groundwater percolating down through the overlying Devonian sandstones has dissolved calcium carbonate from a limestone band and precipitated it at a spring line where it meets the impermeable top of underlying mudstones at the base of the limestone. Impressive cliffs of tufa are to be seen in the woodlands of the escarpment in locations with spine-chilling names such as Witchery Hole, Hell Hole and Devil's Dingle. This tufa with its free carving and lightness has been used as a local building stone. Its importance is best illustrated in Worcester Cathedral, where it was used in the vaulting of the transepts.

SANDSTONE is formed as the land is eroded and small particles of rock are carried away by wind and water to be deposited on river beds, in deserts or on the sea floor. Sand sized particles may accumulate to a thickness of many metres. Over time the sediment is buried, compressed and cemented into a hard rock called sandstone.

LIMESTONE was formed in a warm shallow sea such as today's great barrier reef off the east coast of Australia. The shell fragments of dead sea creatures fell to the bottom of the sea and these were eventually compacted and cemented into rock.

QUARTZ or Silica is a mineral with the composition silicon dioxide. It occurs commonly in many different forms. It is an original constituent crystal in many igneous rocks, forms the bulk of the grains in sandstones and is also a prominent constituent of veins that cut through older rocks. It can be found as clear and coloured crystals such as rock crystal, amethyst and rose quartz. Silica occurs also as flint, agate and jasper.

Wribbenhall, Worcestershire. The **railway viaduct** carries the lines of the Severn Valley Railway over the main road in to Bewdley station. It is constructed with large impressive blocks of red sandstone (S) which were quarried close to the southern end of the station. The rock was formed from wind blown sand in a desert during the Permian period. It is rock of the same age and origin as that on which Bridgnorth town is built. (DY12 1DQ / SO790754)

West Midlands Safari Park, Wribbenhall, Worcestershire. The **shopping mall** which marks the access to the various pedestrian attractions is walled with dolerite (I). This is an igneous rock and was supplied from the quarries of the Clee Hills or the Rowley Hills. This dark grey rock which was formed in the Carboniferous period is a very hard, resistant material and is usually crushed and used as a roadstone. *There is a charge to enter the Safari Park.* (DY12 1LF / SO804756)

Stourport on Severn, Worcestershire. Stourport is famous for its canal basins which were begun in 1768 and which were constructed under the guidance of James Brindley. The locks and their associated walls are made of red and grey sandstones (S). These are rocks of Triassic age and were formed in lots of braided and meandering river channels at the time. There is a particularly impressive wall of sandstone blocks running along Cheapside. *There are history trail leaflets available in the town.* (DY13 9FG / SO812708)



www.geopark.org.uk

Abberley and Malvern Hills Geopark

Discover different landscapes, rocks, fossils, wildlife, archaeology and history. Here is a Geopark that can be enjoyed by everyone - an opportunity to experience and learn about its impressive natural and man-made landscapes. More information can be found in the visitor centres, museums and tourist information centres across the Geopark.

- 1 Severn Valley Country Park
- 2 Severn Valley Railway Visitor Centre - The Engine House
- 3 Bodenham Arboretum
- 4 Living Dinosaurs (West Midlands Safari Park)
- 5 Bewdley Museum
- 6 Wyre Forest Centre
- 7 Worcestershire County Museum
- 8 Martley Geovillage
- 9 Cob House Country Park
- 10 Explore the Past (Hive Worcester)
- 11 Worcester Museum
- 12 Worcester Cathedral
- 13 Malvern Museum
- 14 Malvern Hills GeoCentre & Geopark Way Visitor Centre
- 15 Hereford Cathedral
- 16 Hereford Museum
- 17 Ledbury Heritage Centre
- 18 Gloucester Cathedral
- 19 Gloucester Museum

Key

- Geopark
- Visitor Centre
- National Trust
- Major Road
- Motorway
- Railway
- Railway Station
- Severn Valley Railway
- River
- Hills
- Town/City
- Start of each section of the Geopark Way



Geopark Way

The Geopark Way is a 109 mile walking trail, running from Bridgnorth to Gloucester. Divided into 17 easy to walk sections. Guide book and apps are available for the trail.

