Reading Geological Society

Shropshire Field Meeting Report

Monday 9th September to Thursday 12th September 2024

Leaders: Albert Benghiat (Shropshire Geological Society), David Smith (Shropshire Geological Society) and Peter Worsley (Reading Geological Society)

RGS Field Meeting to Shropshire

9th -12th September 2024

Leaders: Albert Benghiat (Shropshire Geological Society), David Smith (Shropshire Geological Society) and Peter Worsley (Reading Geological Society)

The four day RGS field meeting to Shropshire was led by Albert Benghiat and David Smith from the Shropshire Geological Society and Peter Worsley from the Reading Geological Society. The objective was to complete a geological transect from the igneous and metamorphic rocks of the Proterozoic, through the classic Cambrian, Ordovician and Silurian successions to the Carboniferous, Permian and Triassic sequences in east Shropshire. The trip finished with examination of the evidence for the Devensian ice advance across the area.

Monday 9th September, 2024 – The Hermitage, Bridgnorth

The Hermitage, Bridgnorth

GR - SO 72760 93387; 52°32′16″N, 002°24′11″W; W3W - yachting.home.mission

Our visit to Shropshire started with negotiating the back roads of Bridgnorth to begin a walk up to The Hermitage; caves in the Bridgnorth Sandstone. Unfortunately, the group got scattered on our travels but the majority of us reached our destination. The caves provide exposure of the uppermost part of the Bridgnorth Sandstone Formation and unconformity with the overlying Chester Formation (Figure 1).

The Bridgnorth Sandstone is a red, medium to fine-grained sandstone of early Permian age with large scale cross-stratification and sets up to 2 m in thickness. These are aeolian dune deposits and were examined in more detail at the second locality; Quatford. The Chester Formation is a conglomerate which contains quartzite and quartz cobbles in a sandy matrix cemented by calcite. The conglomerates were deposited from fluvial systems prograding across southern Britain from the south.

Peter reminded us that the conglomerate was called the Kidderminster Conglomerate further south in the Midlands and the Chester Conglomerate to the north but was the Bunter Pebble Bed of old.

The BGS aging of the Chester Conglomerate is that it is early Triassic (Olenekian) age. Hence, there is a 22 My+ gap with no record of the intervening upper Permian in this area. Peter said that elsewhere the contact between the two formations was planar, but at the Hermitage the boundary was clearly incisive and the conglomerate fills a scour cut into the underlying sandstones.

Figure 1 *Unconformable boundary between the Bridgnorth Sandstone and the overlying Chester Conglomerate, with the fluvial gravels clearly incising down into the cross stratified aeolian sandstones.*

Quatford

GR - SO 73836 90350; 52°30′37″N, 002°23′13″W; W3W - scrapped.seasonal.longer

Having re-gathered, the group, we drove to Quatford on the A442. Here a series of road cuttings through the Bridgnorth Sandstone reveal the large scale cross-stratification seen previously (Figure 2). In the section viewed, the foresets dip predominantly to the north. When we examined the sands in more detail, it was apparent that they were medium to fine-grained without pebbles or mudclasts. The sands in laminae are well sorted but differences in grain size are apparent between laminae (Figure 3). The coarser grained laminae contained frosted ‘millet seed’ grains and it was concluded that these were aeolian deposits. When we stood back from the section it was apparent that while the dominant dip of the stratification was to the north, at either end of the section differences in dip are apparent.

Peter explained that in the 1930’s Prof Fred Shotton and members of the Lapworth Society at the University of Birmingham had mapped out the sands and concluded that the dominant direction was to the west. Karpeta (1990) interpreted the sands as transverse and barchanoid draa deposits.

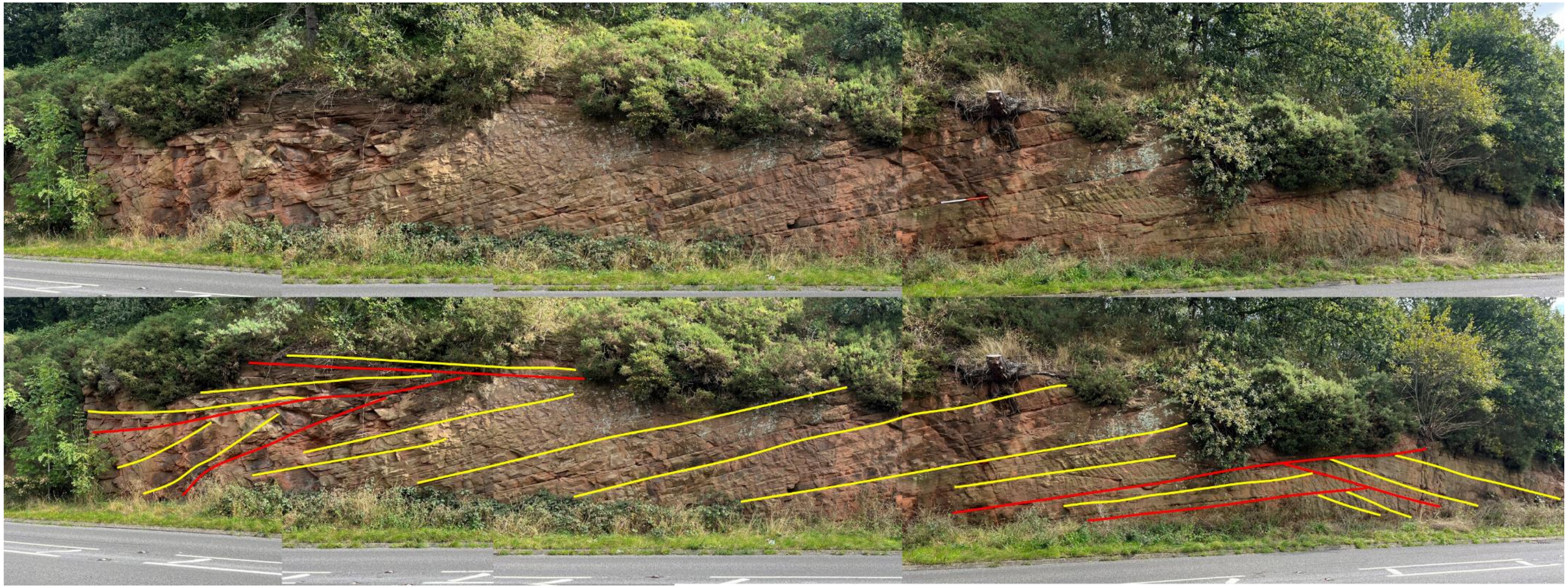

Figure 2 Predominantly northward dipping aeolian cross-stratification in the Bridgnorth Sandstone at Quatford. Red lines indicate 1st or 2nd order surfaces (differentiating dune bodies, migrating in different orientations), while the yellow lines indicate 3rd or 4th order surfaces (marking the migration or re-activation of individual dunes).

Figure 3 Cross-stratification in a Bridgnorth Sandstone, showing packets of finer grained laminae separating thicker packets of coarser-grained sand.

After lunch at Quatford, we drove to Lyth Hill were we were met by our leader for the next two and half days, Albert Benghiat and other members of the Shropshire Geological Society.

Lyth Hill

GR - SJ 47152 06811; 52°39′23″N, 002°46′58″W; W3W - mentions.marzipan.basic

On a stunningly sunny day (we might not have been able to see nearly so much in the rain!), Lyth Hill gave a panoramic view across southern Shropshire and provided an excellent backdrop to Albert's introduction to the geology of Shropshire (Figure 4). The NE-SW orientation of Lyth Hill parallels the main structural elements in southern Shropshire which is dominated by the Caledonide trend of the Church Stretton and Pontesford Linley faults. Movement on these faults impacted the late Proterozoic and Lower Palaeozoic geological history of the area (Figure 5).

Albert set the scene for the following days with a description of the geological evolution of the area. Shropshire contains rocks dating from the Jurassic back to the Precambrian (Figure 5).

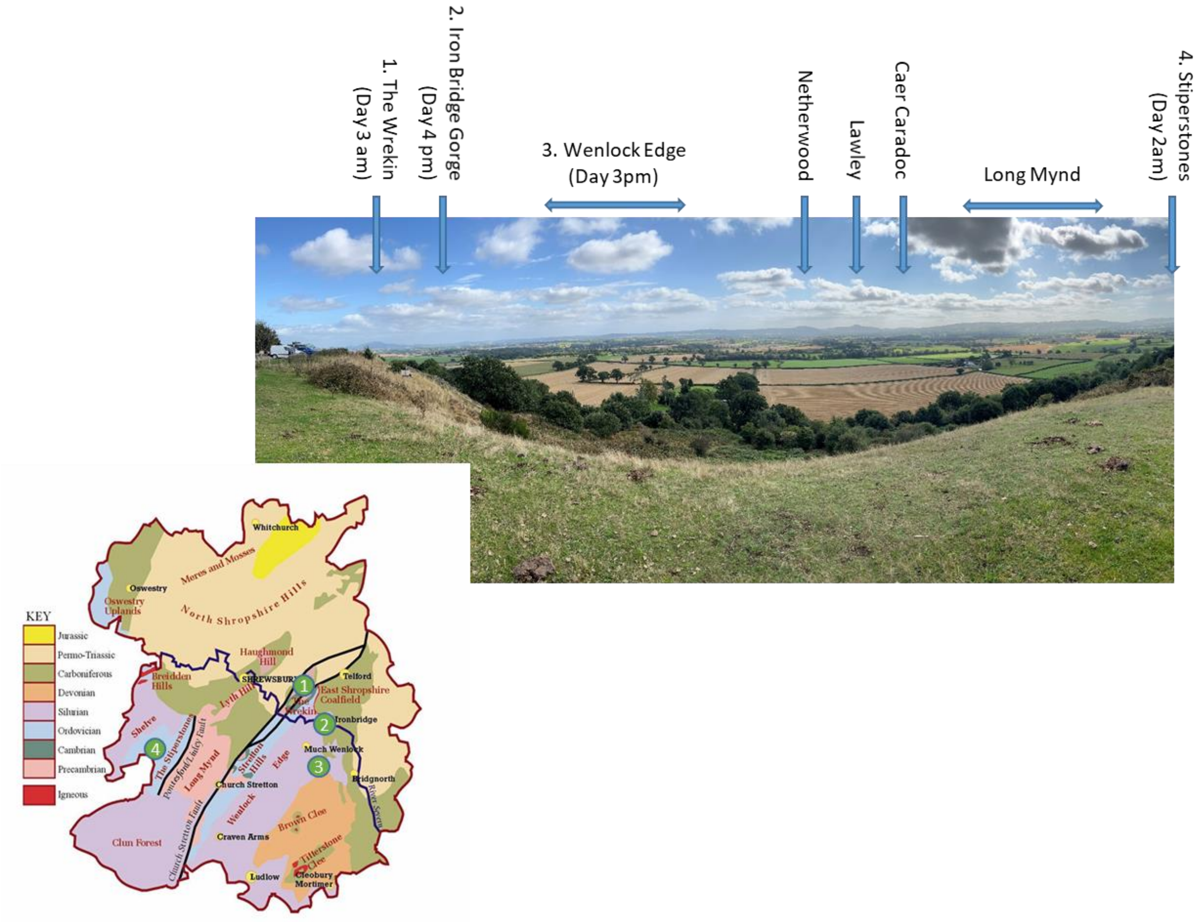

Figure 4 *View to the south from Lyth Hill across southern and eastern Shropshire and the locations visited on the following days.*

The oldest rocks present in Shropshire; the Rushton schist and Primrose Hill gneiss were formed ca 670 My ago. At this time, Shropshire was on the NW margin of the Avalonian plate which was part of the Gondwana Supercontinent. The early Proterozoic rocks were deformed and metamorphosed during the Cadonian orogeny. By 570-560 Ma, the margin of Avalonia was a strike slip plate boundary and the Uriconian volcanics erupted through the thinned crust. In the Wrekin area, flow banding rhyolites were laid down and the Ercall granophyre was intruded (Day 3 am).

The Uriconian volcanics were predominantly subaerial extrusives and the area to the NW of the Church Stretton fault subsided rapidly receiving up 7,000 m of materials derived from the volcanic arc and forming the Longmyndian Supergroup. The Longmyndian succession shallows stratigraphically upwards from deep water mudstones with turbidites to deltaic and fluvial sediments. Deformation between 555-550 Ma resulted from left lateral movement on the Church Stretton and Pontesford Linley faults causing transpression and folding of the Longmyndian into a tight syncline (Figure 6).

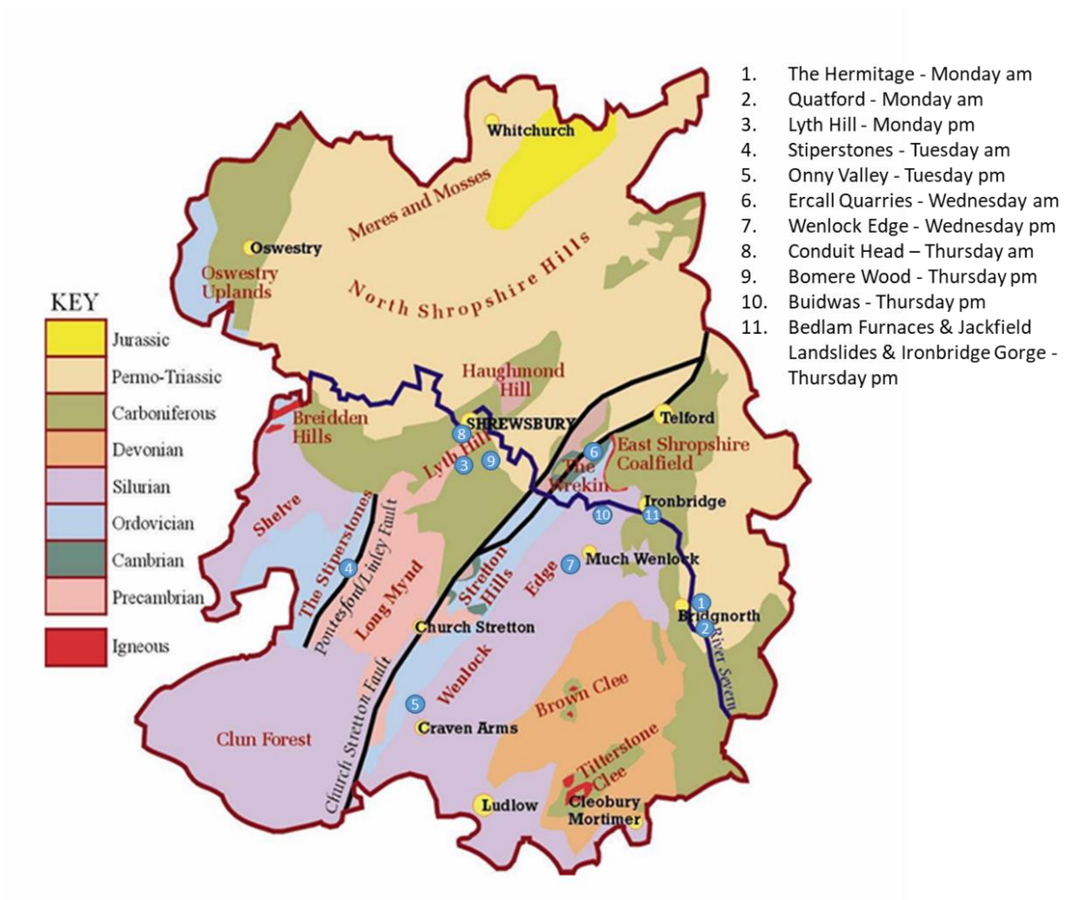

Figure 5 Simplified geological map of Shropshire (from Toghill, 2006), with some of the locations visited on the field meeting.

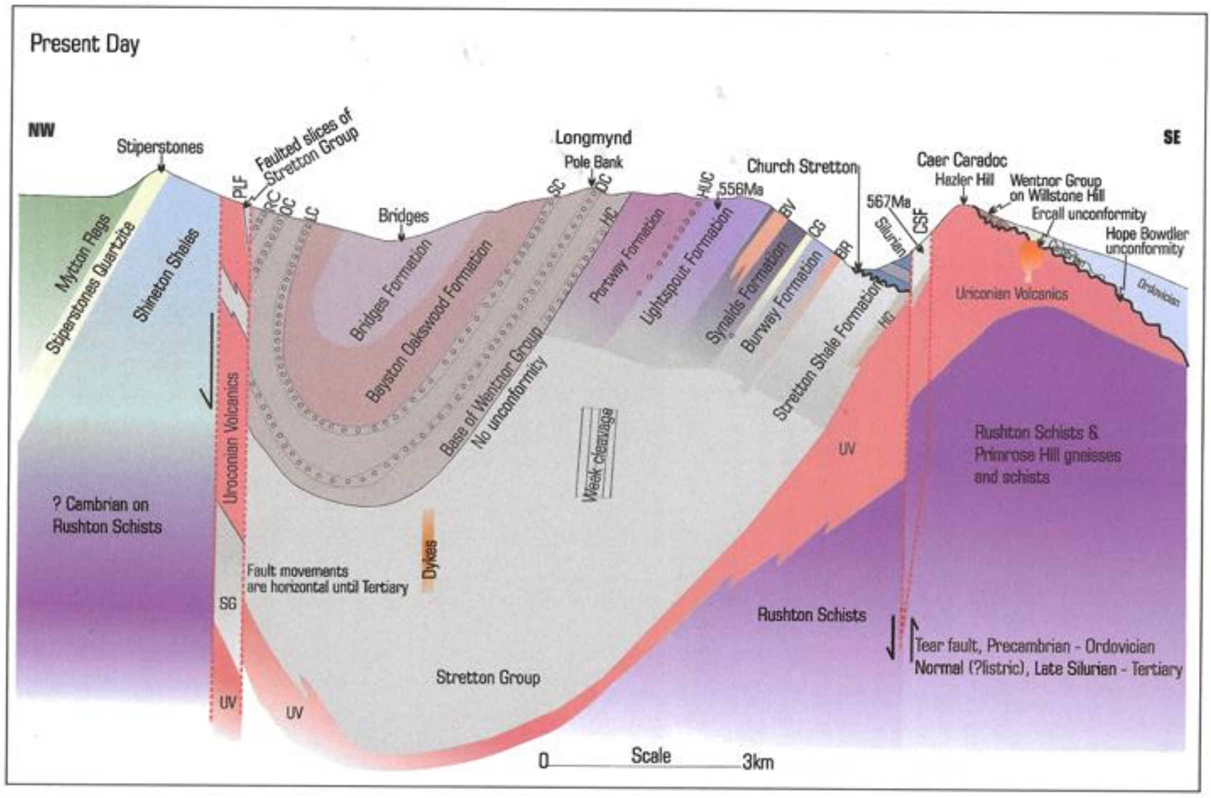

Figure 6 Long Mynd Syncline showing the folding of the thick Longmyndian Supergroup (from Toghill, 2006).

Following deformation of the Longmyndian, the Cambrian marine transgression covered the area. Little is preserved of the Cambrian succession in Shropshire due to subsequent erosion, but around the Wrekin quartzites and sandstones were deposited – Wrekin Quartzite and the Comley Sandstone (Day 3 am).

By the Ordovician (485-443 Ma), Avalonia had detached from Gondwana and started to move rapidly northwards as the Iapatus Ocean was subducted beneath Laurentia. The early Ordovician (Tremadocian) was marked by a regional marine transgression with mudstones deposited across the area. Reactivation of the Pontesford-Linley and Church Stretton faults in the later Ordovician resulted in distinct lateral facies variations, with a thin, condensed succession to the east of the faults (Caradoc area) and a thick mudstone-dominated succession to the west (Shelve area). Shoreface deposits were deposited on the Church Stretton high and the margins of the Pontesford-Linley fault including the Stiperstone sandstones and quartzites (Day 2 am).

To the east in the type Caradoc area, the Ordovician onlaps onto the Uriconian volcanics and the succession comprises an alternating succession of hard sandstones and soft mudstones, as seen in the Onny Valley (Day 3 pm).

Late Ordovician folding deformed the earlier Palaeozoic successions further before the Silurian associated with collision of Avalonia and Baltica. During the Silurian (443-418 Ma), the differentiation of the shelfal area to the west of the Pontesford-Linley and Church Stretton faults and deep basinal area to the west persisted. On the shelf, fluctuations in sea level resulted in a succession of mudstones (Wenlock Shale, Lower and Upper Ludlow Shales) and limestones (Wenlock & Aymestry Limestones). This contrast in lithologies has had a strong impact on the topography on the area producing scarps and vales (Day 3 pm).

By the end of the Silurian, the Iapetus Ocean had fully closed and Avalonia collided with Lauratia to form the Caledonian mountain range. Britain at this time was on the edge of the ORS continent with the Rheic Ocean to the south. Deposition is characterised by braided rivers cutting coastal floodplains and deposition of fluvial sands, conglomerates and mudstones.

The early Carboniferous saw marine transgression across the area with deposition of thick limestones on a carbonate platform. Subsequently, progradation of deltas from the north across Scotland and the north and midlands of England occurred during the Upper Carboniferous with coastal floodplains with coal swamps, deltas and fluvial channels (Day 4 pm).

Post Variscan Orogeny succession (Late Carboniferous-Triassic) – generation of the Hercynian highlands to the south and detritus shed northwards through the Worcester Graben and into the Cheshire basin. The basal unit of this package was the Cardiston Breccia with clasts of Carboniferous limestone, which is locally used as a building stone. The subsequent drying of the climate resulted in deposition of aeolian clastics of the Bridgnorth Sandstone and then the Cheshire Conglomerate at the base of the Triassic.

Albert was able to articulate the story by pointing to the locations in the distance and using laminated sheets from Peter Toghill's book (Toghill, 2006). But to ensure he held our attention, he and his wife brought out tea, coffee and biscuits half way through. This was a nice opportunity to look at the Longmyndian conglomerates and sandstones of the Bayston-

Oakswood Formation that make up Lyth Hill. The bedding was near to vertical, but was well picked out by conglomerates of rounded igneous clasts (Figure 7).

Figure 7 Vertically dipping conglomerate and pebbly sandstones of the Bayston-Oakswood Formation on Lyth Hill. The Bayston-Oakswood Formation form the upper part of the Longmyndian Supergroup. formation.

Report & Photos: Ross Garden

Tuesday 10th September AM, 2024 – Stiperstones

Stiperstones

GR - SO 36712 98484; 52°34′50″N, 002°56′08″W; W3W - mute.mouths.garlic

After breakfast the group headed to the car park, through the picturesque and winding streets of medieval Shrewsbury – our first navigation challenge of the day.

On arrival at Knolls car park (GR - SO 36944 97704) in the Stiperstones National Nature Reserve, we met Albert, who explained that Peter Toghill had kindly agreed to join our group for the morning. This news was warmly received by the group, and we enjoyed Peter's excellent company and in-depth knowledge for several hours.

At the initial briefing Albert and Peter explained that we would be crossing over the Pontesford-Linley fault and looking at the Uriconian Volcanics and the western Longmyndian (Precambrian ~ 565Ma). They explained that the depositional environment at the time was one of a shallow, extensional basin on the edge of a subduction zone.

The group headed off downhill from the car park, along the road, towards the Pontesford-Linley fault and then on to examine outcrops of the Uriconian volcanics and conglomerate. Outcrops were sporadic and poorly exposed (SO 37490 97640), the group were not able to determine any depositional characteristics unlike the exposure of the Longmyndian from the previous day (Figure 7).

Figure 8 View eastwards across the Pontesford-Linley fault towards the Long Mynd.

While walking back uphill to the carpark, Peter stopped and explained about the Pontesford-Linley fault, which runs in a NNE-SSW trend and is denoted on the surface by a shallow valley. The Pontesford-Linley fault is an ancient fault that has been intermittently active since Precambrian times and was originally thought to be a tear fault – analogous to the current day San Andreas fault in California. Horizontal displacement is thought to be between 50 – 100 km. Peter went on to explain that the fault was likely active in a strike slip sense up until the end of Caledonian orogeny in the Mid-Devonian, and since then displacement had been largely extensional. No evidence of recent movement could be detected in the road surface, which the fault crosses (Figure 8). On 2nd April 1990 there was a 5.1 magnitude earthquake recorded at Bishops Castle, approximately 10 km SW of the location on the Pontesford-Linley fault.

The group reassemble in the car park as the weather deteriorated, with rain and strong winds. Heading through the gate and up the hill towards the Stiperstones, the group passes over the lower part of the Ordovician. The Shineton Shale Formation, a grey mudstone, was poorly exposed on the path up to the Stiperstones. Only small loose fragments were visible in the path and it was not possible to identify the contact between the Shineton Shale and the overlying Stiperstone Quartzite Formation. Peter explained that the Shineton Shale pass without a clearly defined break into the overlying sandstone.

Figure 9 Manstone Rock, showing horizontal and vertical joint patterns.

The group walked up the hill towards Manstone Rock (Figure 9), looking at a number of outcrops of the Stiperstone sandstones. The sandstones are quartz arenites (> 90% quartz grains), pale grey in colour and fine-grained, with a silica cement. Near the top of the hill, the group looked for evidence of the depositional environment, finding examples of bioturbation - worm holes in some beds. This enabled the dip to be estimated at approximately 70° in a NW direction.

The group then continued up the hill to Manstone Rock (SO 36712 98484; elevation 536 m). Peter explained that the exposed parts of the outcrop showed an example of periglacial freeze/thaw. A detailed examination of the outcrop then took place and examples of cross-stratification and bioturbation were identified. Peter and Albert then talked about the depositional environment of the Stiperstone Quartzite, mostly likely being a shoreface deposit.

Bog Mine

GR - SO 35694 97813; 52°34′28″N, 002°57′01″W; W3W - dabbling.grapevine.joins

After surviving the weather, the group headed back down the hill towards the car park, and then on to the visitors centre at the Bog Mine a few kilometres way, where lunch was eaten.

The Bog Mine visitor centre (SO 35619 97960) is in the old school house, which served the mining community in the surrounding area. The school house is now one of only a few remaining buildings from the industrial period. The school was open for 129 years, from 1839 to 1968, many interesting displays inside give information about the people who used to live and work in the area.

The main product of the Bog Mine was lead ore and later barites, which were extracted from the Ordovician Mytton Flags Formation - marine siltstones and sandstones. A number of spoil heaps were visible around the car park but a quick investigation revealed that they had been picked clean by the many visitors over the years.

Report and photos: Jim House

Tuesday 10th September pm, 2024 – Onny Valley

Onny Valley

Transect from:
GR - SO 43000 84400; 52°27′16″N, 002°50′25″W; W3W - include.toasted.parkland, to
GR - SO 41249 86146; 52°28′12″N, 002°51′59″W; W3W - leopard.dressings.styled

Our visit to the Onny Valley was rather wet and the river was quite high. We parked at a carpark 500m south of the junction of the A49 and the A489 south of Wistanstow and followed the Onny Trail (SO 43000 84400). The trail mainly follows the line of a disused railway track in a north-westerly direction.

The sediments seen in this area are a condensed sequence ranging in age from Precambrian to Silurian and are exposed in the river channel or in the cliff faces to the west of the channel. The strata dip to the south-east so as we walked along the trail, we walked down section encountering rocks of ever-increasing age.

The first outcrop we encountered (GR SO 427 852) was on the north side of the river and showed a very subtle unconformity between the Silurian Hughley Shales (BGS now name this as the Coalbrookdale Formation), dipping at 18° to the SE lying over the Ordovician Onny Shale Formation of upper Caradoc age dipping at 22° to the SE (Figure 10). The unconformity was probably caused by the collision of the Avalonia and Baltica microcontinents.

Figure 10 Silurian Hughley Shales unconformably overlying the Ordovician Onny Shale Formation. The red dots mark the approximate plane of the unconformity. The similar dips suggest that the period of time missing is not very great, but there is no Ashgillian preserved in Shropshire.

The stones visible on the beach of the river include a variety of rock types washed down river from various Shropshire formations. Apparently, bits of trilobites can be found in the Onny Shale Formation, but the river was too high for us to look for any.

We walked past an overgrown outcrop of the Ordovician Acton Scott Group in which is located an 8 cm thick bentonite layer. This volcanic tuff was dated about 40 years ago as being 466 Ma. Recently, the bentonite layer was looked for as part of an attempt to re-date it with modern techniques, but it could not be found.

The second outcrop we visited (GR SO 421 855) is at an old river cliff of micaceous, fine-grained sandstones and mudstones of the Cheyney Longville Formation (Figure 11). These rocks contain fossils including brachiopods and *Tentaculites* sp., small, straight, screw like impressions (Figure 12), which are generally inferred to live on the sea bed (benthic). *Tentaculites* are extinct organisms, with their various suggested links to molluscs, brachiopods and other organisms being uncertain.

Figure 11 Bedded, fine-grained sandstones and siltstones of the Cheyney Longville Flags. The exposure is approximately 2 m tall.

Figure 12 Tentaculite fossils on a cobble found on the edge of the Onny River.

Figure 13 Brachiopod fossils from the Alternata Limestone.

The third outcrop we visited was located in a railway cutting and was the fossiliferous Alternata Limestone Formation interpreted to be deposited in migrating limestone bars, which contained brachiopod fossils (Figure 13).

The next outcrop (GR SO 413 860) was the well bedded, fossiliferous, Chatwell Sandstone consisting of 30 cm thick beds of sandstone and siltstone with some interbedded mudstones, deposited by storms. As we moved further down the trail the bedding changed from near horizontal to very chaotic and then vertical (Figure 14) indicating the presence of faulting.

Figure 14 Chatwell Sandstone formerly horizontally bedded but now vertically bedded due to faulting.

The last outcrop we visited (GR SO412 862) was a quarry, and the site of the unconformity between the Ordovician Hoar Edge Grit (Caradoc) with the Precambrian Longmyndian sediments. The older Ordovician and Cambrian age rocks are completely missing indicating that this is a major unconformity. The sandstones and grits of the Hoar Edge Grit are a common building stone in this area, and elsewhere it crops out as a prominent feature in the landscape. The main face of the quarry is composed of steeply dipping Hoar Edge Grit which is crosscut by sub-horizontal and inclined fractures (Figure 15). The unconformity is said to occur at the west end of the quarry but although the Hoare Edge Grit disappears and is replaced by less competent weathered material that has formed a gully, the unconformity cannot be seen. It is possible that this gully is the site of the unconformity.

Figure 15 Steeply dipping Hoar Edge Grit Formation which is crosscut by sub-horizontal and inclined fractures.

Report and photos: Sarah Cook

Wednesday 11th September am, 2024 – Ercall Quarries

Leader: David Smith, 1964 Reading Geology graduate and member of the Shropshire Geological Society.

Objective: To view Uriconian and Cambrian exposures, and the Ercall Unconformity.

Ercall Quarries
SJ 64036 09718; 52°41′02″N, 002°32′00″W; dock.fidgeting.twins

We met at a small car park in layby opposite the Buckatree Hall Hotel. Careful navigation was required because of one-way system.

The quarries at Ercall were originally opened to provide roadstone, and all the exposures are of late Precambrian and Cambrian ages. The walk through the area took us to a number of quarries with different rock types.

The first quarry visited (SJ 64130 09600) exposed near vertical Uriconian rhyolitic lavas with flow banding and ashes intruded by a pink granitic rock known as a granophyre (Figure 16). The granophyre is characterised by intergrowths of feldspar and quartz crystals. Locally, weathered granophyre was washed to extract kaolin from the feldspar residue.

Figure 16 Vertically rhyolite with slickensided bedding surfaces.

A second quarry was cut into Uriconian rhyolites and andesites intruded by a basalt dyke.

In the main quarry (SJ 64378 09582), a large granophyre intrusion was quarried. The granophyre is unconformably overlain by the Wrekin Quartzite Formation. Although the base of the quarry is now obscured with undergrowth, the unconformity is clearly visible in the cliff at the top (Figure 17). David said that the Ercall Granophyre had been dated by zircons as 560 Ma and acritarchs from mudstones in the basal Cambrian conglomerates gave dates 533 Ma suggesting that there was only a short period between the intrusion and its erosion.

Figure 17 Unconformity between the Ercall granophyre (left) and the bedded Wrekin Quartzite (right) in the Ercall Quarries.

The basal beds of the Wrekin Quartzite are conglomeratic with clasts derived from the Uriconian granophyre. Close examination of the quartzite beds above the unconformity shows rippling on several beds, orientated in different directions. The symmetry of the ripples suggest wave rather than current origin (Figure 18). Large scale, cross-stratification of the type seen in the Stiperstone Quartzite was not obvious.

Figure 18 Symetrical ripples on a bedding surface in the Wrekin Quartzite.

The rock is much faulted, and recent investigations have found an exposure of Uriconian rhyolites above the quartzite. Also, a vertical outcrop of quartzite is clearly a fault surface with well-preserved slickenslides. The overlying Lower Comley Sandstone Formation could be seen but was too high in the cliff to be approached.

Report and photos: Edmund Shirley

Photo: Figure 16 from Ross Garden

Wednesday 11th September pm, 2024 – Wenlock Edge

Knowle Quarry
GR - SO 58600 97700; 52°34′32″N, 002°36′44″W; W3W - coarser.outermost.heavy

On Wednesday afternoon, in cool, windy weather, we assembled at a National Trust carpark on the B4371 near Presthope. In the Silurian, approximately 425 Ma, the Much Wenlock Limestone Formation was laid down in warm, shallow tropical seas when the region lay south of the Equator. Sea levels – generally high at this time – fluctuated, so that limestone is interbedded with thin mudstones, now eroded into hill and vale scenery. Near the crest of Wenlock Edge, on the dip slope, a number of quarries were excavated for the limestone.

A short walk through deciduous woodland brought us to a series of disused quarries. These are considerably overgrown, but with good exposures on some quarry faces. At Knowle

Quarry, the flaggy, thinly-bedded limestone overlies a series of patch reefs (Figure 19). These reefs, approximately 425 million years old, formed in warm, sub-tropical seas when this region lay south of the Equator. Sunlight reaching the shallow sea floor allowed corals, bryozoan and algae to form these small reefs. The reefs formed positive structures on the sea floor as indicated by the thinning of beds onto them and drapping of the older units over them.

Common fossils here are coral species, bryozoa, gastropods and brachiopods. Trilobites would also have lived in this environment, although few have been left by fossil-hunters.

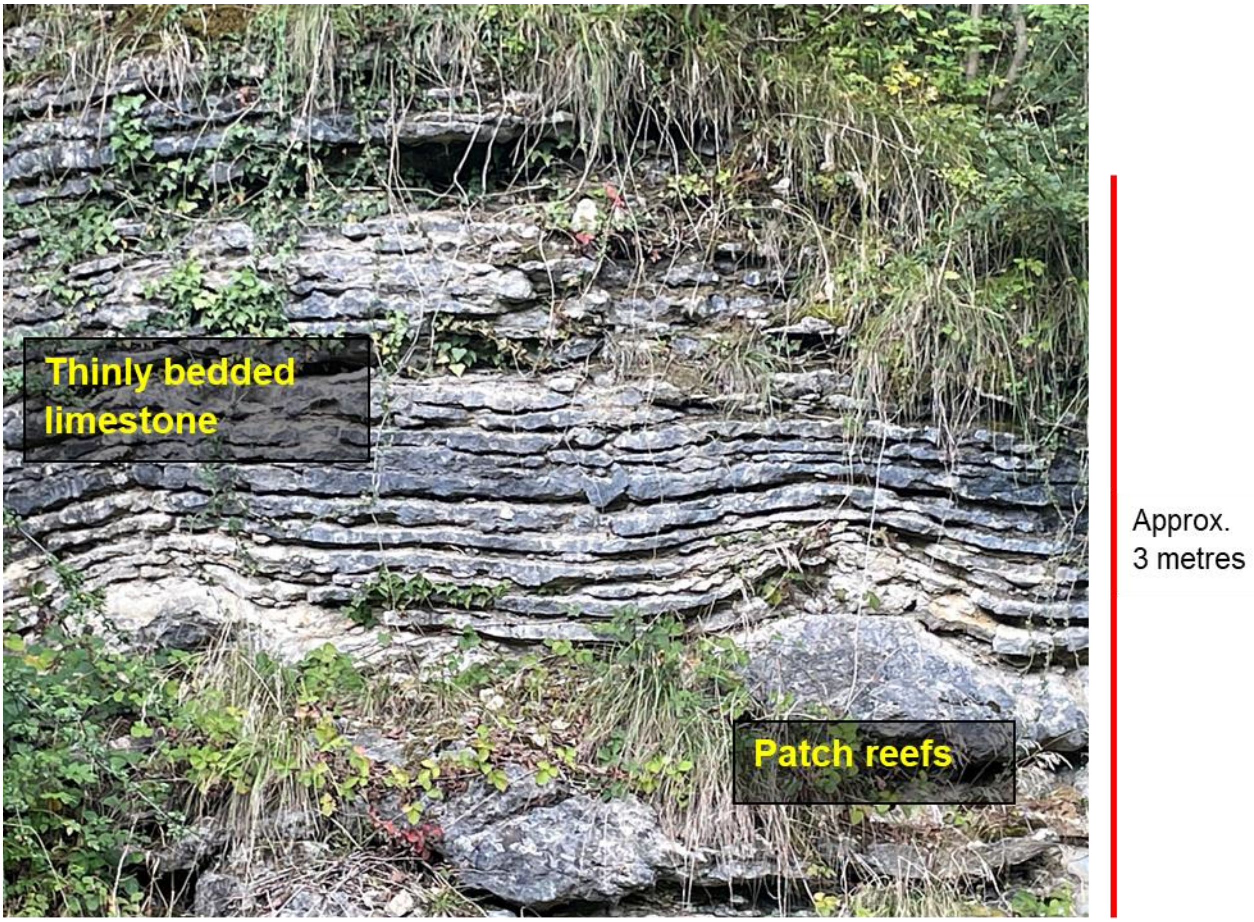

Figure 19 Patch reefs in Silurian Limestone at Knowle Quarry, Wenlock Edge.

These quarries along Wenlock Edge were used mainly for lime: several remains of kilns are to be found.

Westwood Quarry
GR - SO 59567 98333; 52°34′53″N, 002°35′53″W; W3W - post.brownish.deal

Albert left us to our own devices in the Westwood quarry, but before he departed we thanked him for his excellent introduction and leading us over the first three days of the trip.

The second location visited during the afternoon was Westwood Quarry, near Stretton Westwood. This is an extensive site, with large amounts of waste rock as well as several reasonably clean quarry faces. Fossils were common and several specimens were collected by members of the group, including crinoids, brachiopods and a variety of corals (Figure 20; Figure 21).

Figure 20 Fossil-hunting at Westwood Quarry.

Figure 21 Crinoids and brachiopods in Much Wenlock limestone, Westwood Quarry

Report and photos: Jane Wainwright

Thursday 12th September AM, 2024 – Conduit Head and Shrewsbury

Conduit Head

GR - SJ 47226 11145; 52°41′43″N, 002°46′56″W; W3W - issues.taken.home

Following an excellent introduction by Peter Worsley in his Wednesday evening talk to Shropshire Geological Society, we ventured out to see some of his glacial geology localities on the Thursday. The first stop was at the site of Shrewsbury's historical water supply.

Natural springs at 'Conduit Head' (also known as Broadwell) have been utilised since at least 1556 AD as a water supply for the town until abandonment in 1947 by which time all the water was directly sourced from the River Severn at Shelton. However, a new cored 40 m deep borehole, was drilled at Conduit Head in 1956-7 in order to secure a possible uncontaminated groundwater alternative to the Severn water source should there be a nuclear war (Figure 3). We viewed several wells hand dug in Tudor times (Figure 22) and the wellhead of a deeper 1957 borehole.

Figure 22 Housing for a hand dug Tudor water well to supply Shrewsbury.

The mystery here was the high degree of recharge, particularly in the shallow historical wells that the 1957 well. It is unclear whether the bottom of the borehole penetrated the bedrock but the groundwater aquifer was proved to lie within glaciofluvial sediments. The wells were close to overflowing with water at a higher level than the surrounding pools.

Mousecroft Lane quarry

GR - SJ 47476 11183; 52°41′45″N, 002°46′43″W; W3W - stable.valve.linen

A rainstorm then prompted a change of plan and we drove round to the local Coop, hoping to walk to see the original Mousecroft Lane gravel pit so well illustrated by Peter the night before. In the quarry, two sequences of fluvial gravels and tills had been exposed. These represent the Irish Sea and Welsh Ice advances, respectively (Worsley, 2023). Unfortunately, it seemed that Shrewsbury Town Council has failed to recognise the sites scientific importance (particularly as Peter has worked so much on it!) and had allowed new homes to block the hoped for view and then for the site to be completely overgrown, with not a single grain of gravel visible (Figure 23). Help from a local resident was crucial here, despite the resistance of his dog, and the locals seemed surprisingly familiar with the cause of 'kettle holes', though this was no doubt due to some properties on them having been condemned.

Figure 23 The disused gravel pit described by Peter Worsley and indicating the extent of the Irish Sea ice in the Shrewsbury area.

Condover Kettle Complex

GR - SJ 50200 07200; 52°39′37″N , 002°44′16″W; W3W - coconut.science.outlawing

The man-made 'kettle hole' at Mousecroft Lane quarry was fortunately followed at the next site at Condover by the viewing of real Irish Sea ice kettle holes. Here we saw a number of lakes and damp areas with small shrubs (Figure 24). Peter explained that when quarried the kettle holes were found to contain a collection of mammoths bones from an adult and juveniles, but from distinctly different ages.

Figure 24 The Condover kettle hole in the hollow with the bushy vegetation where a number of mammoth bones were recovered.

Report: Duncan Macgregor

Photos: Ross Garden

Thursday 12th September PM, 2024 – Condover to Ironbridge

Bomere Wood

GR - SJ 50200 07200; 52°39′37″N, 002°44′16″W; W3W - coconut.science.outlawing

After leaving the Condover kettle complex, it was decided the weather was too wet to view the esker, another 300 m along the track. This is an impressive feature, 10 to 15 m high and about 500 m long, seen by the author on a previous occasion Figure 25 shows a picture of this feature; the crest of the esker runs from left to right in the foreground, with sheep and cattle grazing in the slopes.

Figure 25 Viewpoint towards the Bomere Wood esker. The crest of the esker runs from left to right in the foreground, with sheep and cattle grazing in the slopes.

Viewpoint B4280 roadside

GR - SJ 61978 04959; 52°38′28″N , 002°33′48″W; W3W - similar.superhero.spending

From here was a splendid view of the Severn as it approached Ironbridge Gorge. (Figure 26)

Figure 26 Viewpoint from the B4280 roadside of the River Severn as it approaches Ironbridge Gorge.

Discussion commenced on the origin of the gorge. In pre-Devensian times, the Welsh component of the River Severn drained northwards into the Dee catchment and into Liverpool Bay. Irish Sea ice blocked this route and diverted it southwards crossing the pre-glacial watershed of the Wrekin and Wenlock edge. As we had learnt this morning, Shropshire had been glaciated by ice from the north, north-west and north-east by the Irish Sea ice sheet and from the west by the Welsh ice. At Mousecroft Lane, in Shrewsbury, for example, we heard that there was stratigraphical evidence of this with till from Welsh ice overlying sands and gravels of westerly derivation, in turn overlying a till and sands and gravels from Irish Sea ice (Worsley, 2023). Figure 27 shows the mapping of Welsh and Irish Sea ice in this area, the brown indicates the Welsh ice margins and the blue represents the Irish Sea ice margins. The Last Glacial Maximum (LGM) is represented by the red pecked line.

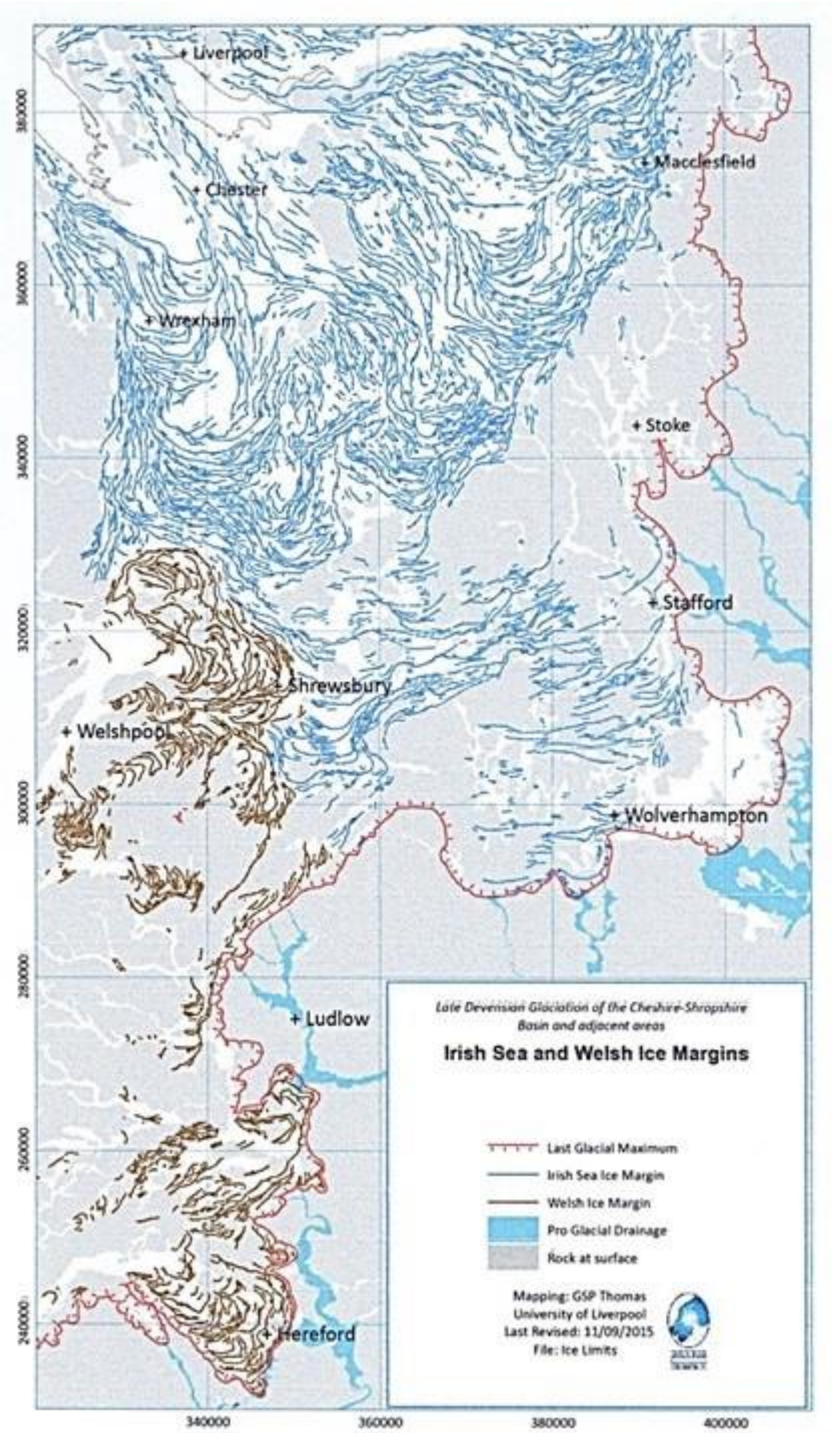

Figure 27 Late Devensian glaciation of the Cheshire-Shropshire basin showing the extent of the Irish Sea and Welsh Ice margins.

Continuing the discussion about the gorge, there are still differing views on how the gorge was initiated; the concept of catastrophic drainage of an ice dammed lake has been disputed, but there no doubt that there were ice-dammed lakes at various times with ice-marginal drainage channels. Deep channels have been revealed by boreholes, the Buildwas Channel and Lightmoor Channel; these suggest sub-glacial components.

Buildwas SJ 642 038

GR SJ 64200 03800; 52°37′51″N, 002°31′49″W; W3W - flitting.cheering.flanked

Leaving cars at Park Farm (point X on the map Figure 28), the group walked SE to a viewpoint of the Severn from the south, point A. The BGS map showed the bedrock geology as mudstones of Coalbrookdale Formation (previously Wenlock Shale). Examining the surface geology here, we found sandy, clayey gravels with erratics, a fluvio-glacial deposit. The field immediately to the north (B on Figure 28) was mapped by BGS as a river terrace, (Second Severn terrace, Cressage Terrace) but we could see no particular reason why this had been so. The surface geology seemed no different to point A.

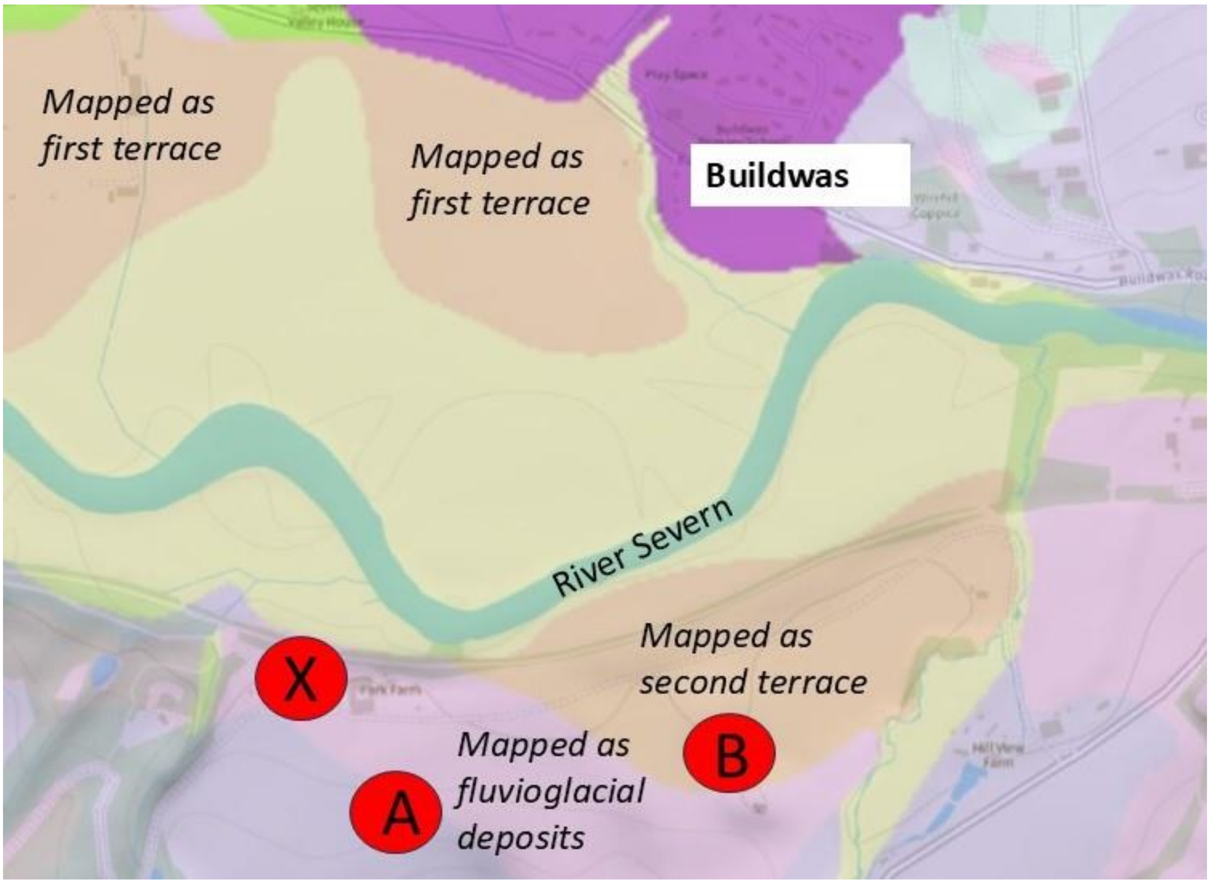

Figure 28 Map of the Severn river terraces near at Park Farm (from BGS GeoIndex Onshore).

The surface undulated and there are obvious kettle holes as can be seen in Figure 29. We concluded that this was probably a westward extension of the Buildwas Sands. We looked across the river and agreed that the flat surface of the fields opposite near Buildwas did represent a possible terrace but at a lower level (first Severn terrace or Atcham Terrace). The “take-away” from this, was that the BGS were not always correct! A short discussion ensued about kettle hole formation; on ice-contact terrain, buried ice melts and the sediments collapse, leaving hummocky surface with depressions. We also noted many landslip features on the opposite side of the river.

Figure 29 Kettle holes in the area mapped as Second Severn terrace, Cressage Terrace.

We passed the iconic Ironbridge but not able to stop due to lack of parking.

Bedlam Furnaces

GR SJ 67824 03359; 52°37′37″N, 002°28′36″W; W3W - tailwind.emailed.shackles

The birth of the Industrial Revolution was here in the Ironbridge Gorge. The next stop was at the Bedlam Furnaces originally built between 1757 and 1759. Here smelted iron ore made molten iron. This was the first furnaces designed to use coke as fuel instead of charcoal. Both coal and iron ore were mined locally, and these furnaces continued production into the middle of the nineteenth century (Figure 30).

Figure 30 Bedlam furnaces at Ironbridge.

Jackfield Landslides

GR SJ 68802 02731; 52°37′17″N , 002°27′44″W; picturing.camped.shadows

Crossing the River Severn at Jackfield Bridge to the south bank, we drove eastwards along the river where there is extensive slope instability, passing the Jackfield Tile Museum and noting the characteristics of land-slippage on the south side of the road. The next top was at the board describing the major landslide of 1952 which devastated the village of Salthouses and blocked the railway and how the land was stabilised. (Figure 31). Across the river at Lloyds Coppice, the dip of the Coal Measures and the overlying Etruria Formation and Halesowen Formation is to the north, so rotational failures have occurred, which along with the mine waste has given rise to great slope instability. Little could be seen however, as the slopes are now wooded.

Figure 31   Jackfield Landslides information board.

The Hay Incline and the Boat Inn

GR SJ 69426 02601; 52°37′13″N, 002°27′11″W; W3W - sage.shelters.listen

We crossed the fast flowing and deep River Severn at the Boat Inn via a footbridge to the Hay Incline on the north side; which is an impressive piece of Victorian engineering used to raise canal boats up two parallel railway tracks to the Shropshire Canal above. Interestingly, the track had kinks in it, indicative of subsequent slope failure. (Figure 32).

Figure 32 River Severn at the Boat Inn and the Hay incline built to transport boats from the Severn to the iron works at Blists Hill.

Back in the car park of the Boat Inn, the flood levels were examined with interest, realising the river frequently flooded very dramatically here.

Thanks were given to Peter for leading us for a day on the subject of the glacial geology of the Shrewsbury area, which was the topic of the Shropshire Geological Society lecture he gave the previous evening.

Report: Hilary Jensen

Photos: Hilary Jensen and Peter Worsley

References

Karpeta, W.P. 1990. The morphology of Permian palaeodunes a reinterpretation of the Bridgnorth Sandstone around Bridgnorth, England, in the light of modern dune studies. *Sedimentary Geology*, **69**, 59-75

Toghill, P. 2006. *Geology of Shropshire* (2nd Ed). The Crowood Press Ltd. pp. 256.

Worsley, P. 2023. Glacial geology of the Shrewsbury area, Shropshire, with particular reference to a Welsh readvance. *Mercian Geologist*, **20**, 231-242.