Fforwm Cerrig Cymru  Welsh Stone Forum

Number 20, 2024 **Price £6.00**

Welcome to the Welsh Stone Forum Newsletter 20. This is being sent out a little later than planned. As you will be aware much of the running of the Welsh Stone Forum happens from, and is supported by, the Department of Natural Sciences, Amgueddfa Cymru - National Museum Wales, which has been subject to servere cuts in funding. One impact of this is the loss of the Mineralogy& Petrology Section staff, most specifically the loss of Andrew Haycock's curator post. As a result of this Andrew would like to step down as Treasurer, as he takes up work elsewhere. We would like to thank Andrew for all his hard work in the Treasure's post and informal communications role, and for leading many enjoyable field meetings. Thank you to everyone who has sent best wishes to Andrew. We wish him best for the future and hope we he is able to still participate in Forum activity.

At the AGM we will be electing officers. If you would like to stand for Chair, Secretary, Treasurer, Field Secretary, or Field Recorder, then please let me know prior to the AGM. We are also happy to hear from anyone who would like to contribute to WSF activity in a more informal role.

We have done the best to arrange a programme for 2024, although details are still being firmed up. We will circulate these prior to each meeting. Please contact the Field Secretary Mike Statham (Mike.Statham@hotmail.com with any queries.

We are always happy to hear about active projects or proposals for field visits at any time. Ideally, we like to visit sites and exposures where there has been some recent research or investigation, however, we are also happy to help projects by providing geological support. Contact Jana (jana.horak@museumwales.ac.uk) if you wish to take up this offer.

Similarly we always welcome articles for the Newsletter focussed on characterisation of building stone in Wales or examples of their use in the built environment. Please send your articles to Jana Horák (Secretary/Newsletter Editor) at the e-mail address above. Finally, many thanks to all who contributed to this edition.

Jana Horák
(Newsletter Editor)

PROGRAMME 2024

AGM 2024: Tintern

Meet at the Anchor Inn, Tintern, 10.30 for coffee followed by AGM at 11.00.
After lunch at the Inn we will visit Tintern Abbey, guided by Dr Will Davies (Cadw) to gain an overview of the current 5-year conservation project. Time permitting we will then visit the Tintern Stone quarries at Barbadoes Wood. Please wear stout footwear.

May 20th: There is currently no trip scheduled for May, but we will be in contact if an informal meeting is arranged.

June 15th: Rhyader and Builth Wells

Leader: Eric Evans
Following the highly enjoyable trip lead by Eric last year, he is planning a trip to sites in Wales further to the west. Details of meeting point and itinerary to follower nearer to the date.

July 13th: Gwent Level Part 3

Leaders: Graham Oliver & Jana Horák -
This trip will visit further sites on the Levels to look at medieval use of stone investigated during the survey of Gwent Levels. If there is sufficient interest we can also include a visit to exposures of Sudbook Stone.
Meeting point and itinerary to be provided nearer to the date.

September 14-15th or 21st-22nd Building stone in NE &Cheshire

A opportunity to look at Permian of the Cheshire Basin (e.g. Runcorn Stone & Storton on the Wirrel) and Carboniferous sandstone in NE Wales (e.g. Ewloe, Northope and Mosty). We will send an update once Ruth and Andrew have a better understanding of the avaiability to run this trip.

October 6th: St David's Cathedral

Leaders: Maddy Gray & Tim Palmer
Our last visit in 2017 we were precluded from being able to follow our proposed itinerary, as a concert was being help in the cathedral.
Details of meeting time sand location will be supplied nearer to the date.

Dyfed Elis-Gruffydd

It is with great sadness that we report the death of Dr Dyfed Elis-Gruffydd who passed away 16th October, 2023. He made a huge contribution to science and scholarship in Wales and was also a founder member of the Welsh Stone Forum, contributing to early editions of the Newsletter. Dyfed studied physical geography at University College London, followed by a PhD in the geomorphology of Bannau Brycheiniog. He taught at Sir John Cass Institute and the City of London Polytechnic and in more recent times at Trinity St David.

He had a varied heritage-based career, initially working for the Pembrokeshire Coast National Park, and subsequently as the first head of the Welsh Woollen Museum, Drefach Felindre and Gomer Press as Welsh Language Editor.

Throughout this period Dyfed campaigned vigorously for a Welsh Language television channel and for equal rights for Welsh language. Sadly his life was changed when he was involved in a car accident in which he was seriously injured and his first wife Robina was killed.

Dyfed was one of the leaders of the Welsh language naturalist society, Cymdeithas Edward Llwyd. With his second wife, Siân, they settled in Llechryd east of Aberteifi, where they formed a natural team in the production of Dyfed's later publications.

In latter years Dyfed concentrated on publishing on the landscape and history of Wales. His book *100 Olygefedd Hynod Cymru* (2015), later published as *Wales: 100 Remarkable Vistas,* was shortlisted for the Welsh Book of the Year. Not only did Dyfed publish extensively on geology and geomorphology in Welsh and English, he also produced the first Welsh language dictionary of geological terms *Geiriadur Daeareg a Gwyddorau Daear* (2021) and also wrote *Rocks of Wales* for Gwasg Carreg Gwalch. His final work was a biography of the a Welsh geologist Dr Hick: *The life and times of Dr Henry Hick of St David's and the Bubble that Refused to Burs*t (2020).

Another Penarth Alabaster Monument

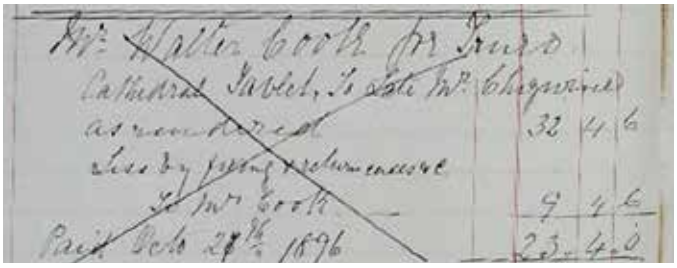
Mike Statham

We have Roland Lamble to thank for informing us of the memorial to Thomas Chirgwin in Truro Cathedral which is constructed of Penarth alabaster (Fig.1).

Photograph 1 Memorial to Thomas Chirgwin, Truro Cathedral. © Dr. Ruth Siddal.

A report published in the West Briton and Cornwall Advertiser of 26th December 1895 states:- '

The inscription given below is cut in Early English letters, gilded, on a slab of delicately-tinted alabaster, from a quarry belonging to Lord Windsor, by whose express permission it was taken. The slab is framed in a well-cut moulding, decorated with rosettes and fleur-de-li. The w*hole is backed by a piece of Ashburton Marble. The work was executed by Mr. Clark*, [sic] *of Llandaff, from the design of Mr. S. Trevail, F.R.I.B.A., of Truro*.'



Photograph 2. Extract from W. Clarke's Bill Book 4, p 83. © W. Clarke Llandaff & Mike Statham.

The transaction is recorded in the archives of W. Clarke, Llandaff, in Bill Book 4, p.83, (1895) (Fig. 2). Unfortunately, there is no extant Day Book record for this item, so the names of the artisans responsible for the work are unknown.

Gleanings from The United Stone Firm's Catalogue

Mike Statham

In 2012 the Forest of Dean Stone Firms Limited published a digitally remastered copy of The United Stone Firms (USF) catalogue of 1912. It contains over 200 excellent quality photographs including stone quarries and mines, stone yards, ships, and harbours, together with structures which incorporate the company's products. Photographs of structures in Wales which incorporate the firm's products are summarised in Table 1. The catalogue also contains photographs of the firm's operations at Porthgain in Pembrokeshire, and their depot in Briton Ferry Dock, which are not discussed in this article.

Aside from the well-known Cornish granites and Portland, Bath, Blue Pennant and Wilderness stones, the less well-known stone types produced by the firm, which have been used in Wales, are described below.

Shamrock Stone

One of the enterprises that USF had taken over were quarries for paving stones in Co. Clare in Ireland. These quarries are located near the famous Cliffs of Mohr. An excellent article on their history has been presented by Griffin (2020). The stone is a close-grained sandstone, usually blue grey, from the Carboniferous Period. It is often loosely described as "Millstone Grit". It is harder than granite and remains non-slip even after heavy wear. It is characterised by the presence of squiggly fossil trails made by unidentified marine animals. Less commonly it may also contain circular burrow/worm holes and ripple marks, like those you might see on a sandy beach. The stone was exported by sea out of Liscannor harbour and certainly in 1912 was unloaded at the USF depot at Briton Ferry Dock.

The stone was widely used for paving in the UK. According to an article in Railway News this stone was supplied to The Great Western Railway as well as other railways in England for paving, steps, platform copings and office staircases. The USF catalogue presents photographic examples of its use in Westminster, Swansea, Birkenhead, and Cardiff. Of the latter location, there are two photographs of unnamed streets, one stated to be in Penylan, Roath, Cardiff, the other noted only as "a street in Cardiff". The stone was used for the paving slabs, curbs, and gutters. Glamorgan Archives kindly identified the streets as Kimberley Road and Amesbury Road, both in Penylan. These locations have been visited and photographed; Figure 1 shows a pavement in Kimberley Road inset with a close-up of one of the slabs.

Although no detailed survey of the locations where this stone has been used has been undertaken, it can be confidently said that it is the main stone present in the pavements of Plasturton Avenue, Cardiff. This location predates Kimberley and Amesbury Roads by about twenty years, which ties in with a record of paving from Liscannor first being tried by Cardiff Corporation in 1892 (Anon, 1892). A further quick search revealed several other newspaper accounts of stone from Liscannor arriving at both Newport and Cardiff Docks later in the 1890s. One record was also noted of an order for paving stone from Liscanor [sic] arriving at Aberystwyth harbour for Aberystwyth Corporation in 1905 (Anon, 1905).

Shamrock stone "shoddies" were also used in the construction of the Public Hall, Briton Ferry, see under Mountcharles stone below.

Nailsworth Stone

Nailsworth Stone was once extensively mined at Balls Green near Nailsworth in Gloucestershire. The bed worked, usually known as the Lower Freestone, is about one metre thick and comprises a cream-coloured medium-grained oolitic limestone of Jurassic age [provide modern stratigraphic ref. ? Confirm if this might be Birdlip Lst?]. Blocks up to seven tons were produced and it was widely used locally over a long period of time. Howe (1910) recommended it for staircases and states it was employed in internal church work for altars, screens, fonts, and tracery work in windows and has also been used for chimneypieces and floors. The USF catalogue contains two photographs of underground operations at Balls Green. It also contains a photograph of the front elevation of the Masonic Temple, Aberavon which incorporated much Nailsworth Stone. The building, which is now CADW Grade II listed was designed by Thomas Gibb, and built by Morgan Cox. It cost £1,960 gifted by Emily Charlotte Talbot and opened in October 1909 (Anon, 1909a & Anon 1909b), at which time the ground floor was a shop. The shop front has since been removed and the gap sympathetically infilled with brickwork and two Bath stone piers and base skirting to match the upper part of the elevation, but the remainder of the elevation is original, Figure 2.

Keinton Stone

USF operated four small quarries in the Blue Lias in Keinton Manderville, about 10km SSE of Glastonbury in Somerset. The stone was generally used for paving and the catalogue contains a photograph of a street in Plymouth paved with it. Plymouth and West Devon archives kindly identified the street as Cambourne Avenue, Lipson, Plymouth.

However, the stone was also marketed for walling and the catalogue contains a photograph captioned "New Schools Aberdare : architect J. H. Phillips" and states it was constructed of Keinton stone "shoddies". This building, which was under construction when the photograph was taken, was the Girls Intermediate School, Cwmbach Road and was opened in 1913 (Anon, 1913). The contractor was T. F. Howells of Caerphilly. The structure still exists but has recently been converted to residential use. It is

Stone Name and Location of Quarries	Description of Building/Structure	Architect
Blue Pennant, several locations in Forest of Dean, Gloucestershire	Conservative Club, Treherbert, known as Ninian Stuart Conservative and Unionists Club.	Jacob Rees
	Royal Buildings corner of Queen Street & Park Place, Cardiff.	
	Ground floor front Carnegie Library, Bridgend now known as Carnegie House.	T. J. Thomas
	Council Offices, Pontypridd,	Henry T. Hare
Red Wilderness, near Mitcheldean, Forest of Dean, Gloucestershire	Cameron Hotel, Swansea (destroyed in bombing raid February 1941)	Charles T. Ruthin
	Co-operative Buildings, Ton Pentre also contained grey Forset of Dean stone (demolished)	W. D. Morgan
	Higher Grade Schools, Gadlys Road, Aberdare. Opened 1907 (under construction). Converted to residential use.	T. Roderick
	John Williams & Sons, 32 Queen Street, Cardiff (demolished?)	Edwin Seward
Nailsworth, Upper and Lower Balls mines near Nailsworth, Gloucestershire	Masonic Temple, Aberavon. Ground floor front was shop now blocked up to match upper floors	J. A. James & Thomas Gibb
Portland, several locations on Portland Bill	New Chapel, New Tredegar (under construction) (after extensive searches this location has not been found)	
Bath, Longsplatt Quarry, Box, Wiltshire	Albany Road Wesleyan Church, Cardiff. Built 1897/8, extended, and altered 1911. Closed as a church in 1990, now part used as a shop.	Jones, Richards & Budgen
	Bishop's Palace, Abergwili, Carmarthen. Now Carmathen Museum. Long history. Repaired after a fire of 1903.	W. D. Caröe
	Offices of John Cory, Docks, Cardiff. Junction of Bute Street and Bute Place.	Bruton and Williams
Mountcharles, several locations around Mountcharles, Co Donegal, Republic of Ireland	New Council Offices, Briton Ferry. Also used Shamrock stone. It was a Public Hall, Cinema and Institute opened in 1911. Demolished 1962, site now occupied by a garage?	H. Alex. Clarke
Shamrock stone, several locations nr. Liscannor Co. Clare, Republic of Ireland	Paving, High Street, Swansea. Lost in the blitz of 1941.	
	Paving, Amesbury Road, Penylan, Cardiff.	
	Paving, Kimberley Road, Cardiff.	
Granite, De Lank quarry, near Bodmin, Cornwall	Entrance of the Technical Institute, Clarence Place, Newport. Now luxury apartments.	Charles F. Ward
Keinton, several locations nr. Keinton Manderville, Somerset	Girl's Intermediate School, Aberdare. (under construction) Now private flats?	J. H Phillips

Table 1. Summary of Welsh Buildings/Other Structures in USF Catalogue of 1912

described by Newman (1995) as "quite a distinguished Arts and Crafts composition". The front and side elevations are Blue Lias, possibly with Doulting stone dressings, (Fig.3). The rear elevation is built of local Pennant sandstone with brick dressings.

Mountcharles stone

Mountcharles stone, quarried near the township of the same name in Co. Donegal, Republic of Ireland, is a Lower Carboniferous sandstone described by Howe (1910) as "grey or cream-tinted, felspathic, and slightly micaceous, with a silicious and ferruginous cement; hard to work, but wears well." It has been extensively used in Ireland; Letterkenny Cathedral, opened in 1901, being built entirely from this material. Via its catalogue USF tried to promote the use of this stone further afield and includes a photograph of "New Council Offices Briton Ferry", which was stated to be constructed of Shamrock stone "shoddies" with Mountcharles stone dressings. The architect was H. Alex. Clarke. West Glamorgan Archives kindly identified the structure from a photograph in a book by Morgan (1979) as the "Public Hall". The contractor was Messrs. E. R. Evans, Bros. of Cardiff, with memorial stones being laid in June 1910 (Anon, 1910). The building contained a picture house, which was opened on 31 July 1911 (Anon 1911). An undated photograph of the front elevation of the hall is available online on the website "Cinema Treasures". The building was demolished in September 1969 (Hemming 1969). No other examples of the use of Mountcharles stone or Shamrock stone "shoddies" have been found outside of Ireland. A sample of Mountcharles stone has been obtained for the National Museum's collection.

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Fig. 1 (top left). Pavement, Kimberly Road, Cardiff & closeup of slab inset . © Michael Statham. Fig. 2 (top right) Front elevation, Masonic Temple, Aberavon. © Michael Statham. Fig. 3 (bottom). Front elevation, former Intermediate School for Girls, Aberdare. © Michael Statham.

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Towards A Walking Tour of the Building Stones of Canton, Cardiff

Graham Oliver & Jana Horák

The Covid epidemic severely curtailed our movements here in Cardiff forcing us to look more closely at our immediate surroundings. The first result of this was the discovery of the use of Purbeck Limestone in Canton and the role of the builder William Symonds (Oliver, 2021). From the surveys that led to the Purbeck story it became apparent that there was a considerable variety of stones used in the development of Victorian Canton. Our observations could have stayed as a personal interest, perhaps as an article for this Newsletter but discussions with those outside our stone circle suggested that building stones could be taken to a wider audience. As a consequence we have begun to develop a walking tour of Canton to introduce aspects of stone and local history.

Methods

Canton was chosen simply because this is where we live and is of a workable size and a recognised urban district with its own history (Jones, 1995). Information on some buildings can be found in Newman (1995) and Perkins (1984). Using high resolution ordnance survey maps and Google Street View it is possible to record the fabric and dressing stones on every building. From this the concept was to design a walking guide of duration of 2 hours to encompass the range of stones visible from the pavement.

The data from the survey could be used to create distribution maps and time delineated maps but we regard this as beyond the interest of the intended audience.

The stones

The dominant fabric is Pennant Sandstone (Figs 1, 2) and dominant dressing is the oolitic limestone, Bath Stone (Fig. 1). Other major fabrics are Radyr Stone (Figs 3, 4), Carboniferous Limestones (Figs 5- 12), Liass Limestone (Figs 13,14), an unidentified limestone (Figs 15, 16), ballast (Figs 17–24) and river cobble (Fig. 25-26). Dressings and decorative work are in Purbeck Limestone (Figs 27, 28), Quarella (Figs 29, 30) and Forest Pennant (Figs 31, 32).

While some stones have a well recorded history and the quarries are well documented, such as Rady Stone and Purbeck Limestone, others remain more obscure. The sources of the various Carboniferous Limestones require closer provenancing, although an exception is Sweldon Stone that we know came from a quarry on what is now B&Q site at Culverhouse cross (Horák, 2019). The grey and red highly fossiliferous Carboniferous Limestones seen in many buildings are undoubtedly local in origin and could most likely from the Pentyrch and Creigiau quarries; although Cardiff is bounded to the north and west by possible other sources.

Ballast has been widely used in Cardiff and fine examples are present in Canton not only in houses but in many walls and back lanes. We are sure there are many interesting stories to relate on the origins of these stones and how they came to be here (e.g. Storrie,1876). While identifying the specific lithologies of these stones may not prove too difficult, there are many possible sources for each type of rock as ships off-loading ballasts could have come from as far north as Norway or south in the Mediterranean. Some may also have come potentially from as far afield as South America (D. Jenkins pers comm). While brick is not included in the survey there are examples of Ruabon decorative work (Fig. 2) and we have yet to decide on including any information on the various types of brick that can be seen.

The following details the stones encountered along a route with 25 stops (Fig. 33).

1. Fossiliferous grey Carboniferous limestone
2. Ballast house
3. Radyr stone
4. River cobble house
5. Red stained Carboniferous
6. Pennant Sandstone
7. Forest Pennant quoins
8. Pennant Sandstone with Ruabon brick/terracotta decoration
9. Carboniferous fossils in wall
10. Purbeck Limestone
11. Purbeck Limestone in Purbeck Street
12. Quarella Stonedecorative work
13. Slag coping stones
14. PurbeckLimestone
15. Sweldon Stone
16. Purbeck Limestone dressings (Cardiff Work)
17. Pennant Stone and Bath Stone church
18. Radyr Stone
19. Sweldon Stone
20. Ballast houses
21. Pennant Stone and Bath Stone church
22. Ballast houses
23. Carboniferous Limestone
24. Carboniferous Limestone ballast (Irish?)
25. Radyr Stone copings

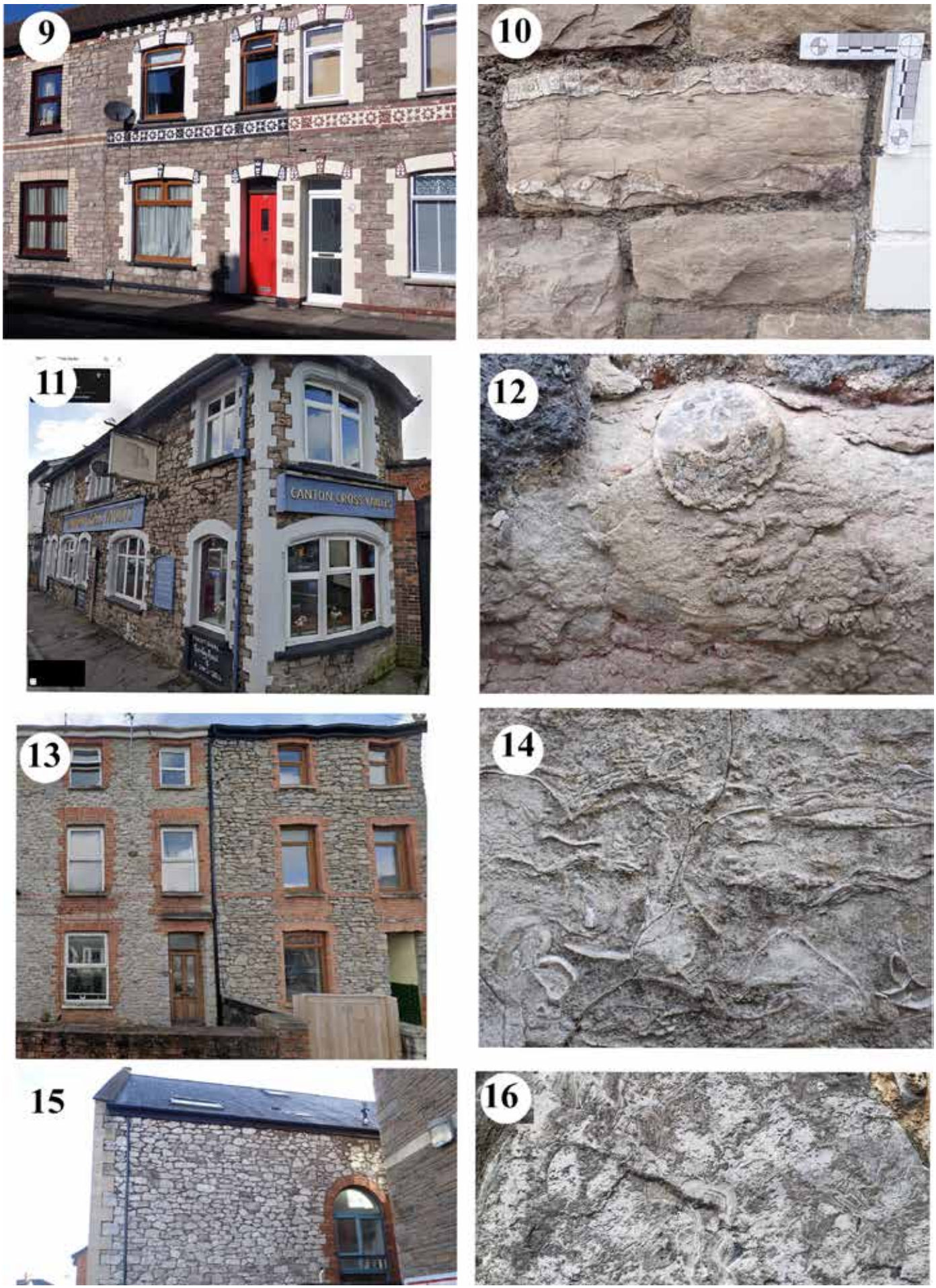
The information

The information given for each property and stone must first be predicated by the intended audience. Our assumption is that there will be a low level of geological knowledge and also that this audience will be interested in aspects of local history related to the buildings. The aim is to provide the following

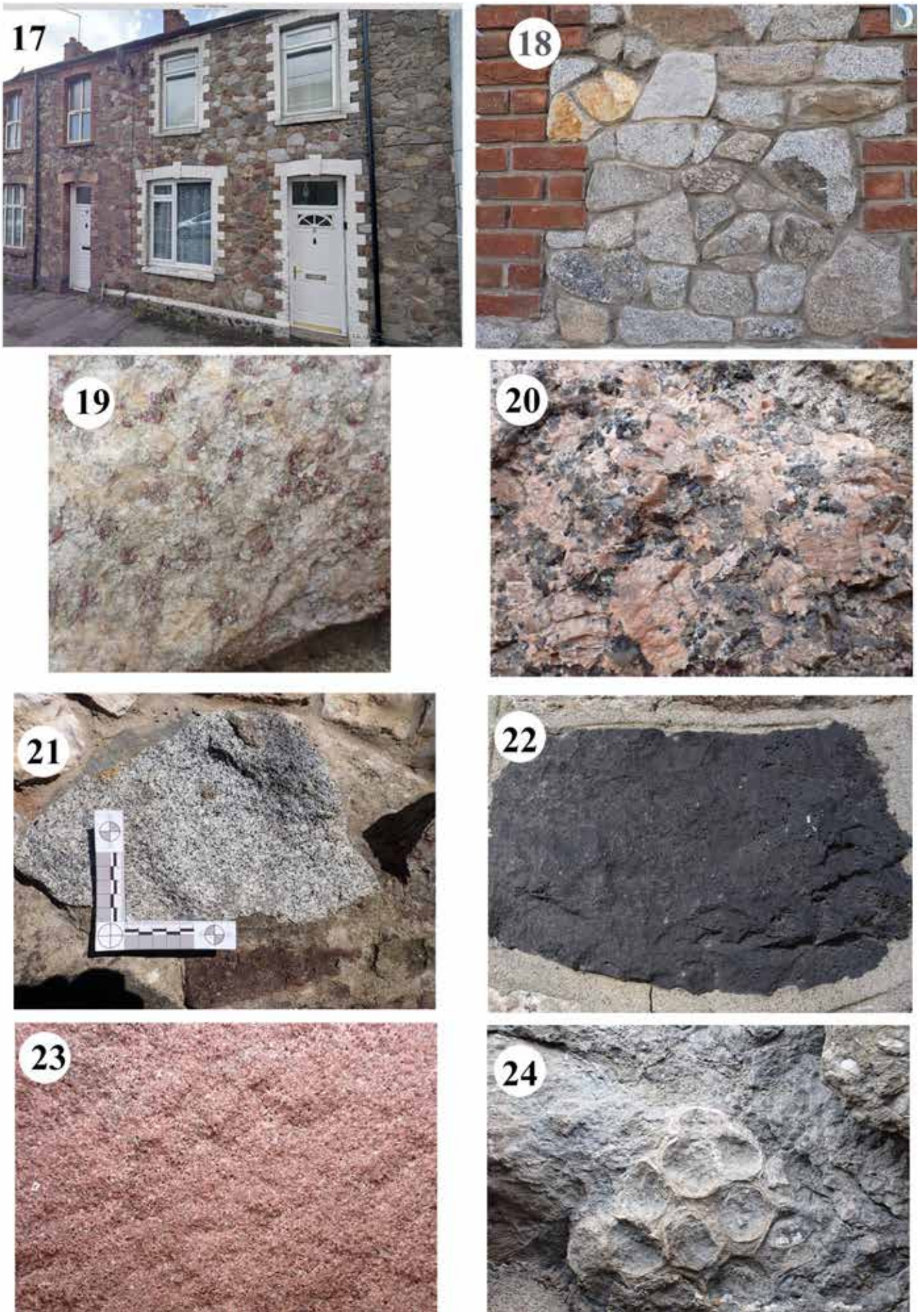
- Name of stone
- Type of stone, how it was formed and when.
- Critical features and fossils.
- Where was it sourced.
- How old is the building, who built it.

The level of historic data will depend largely on the type of

1, Pennant and Bath, Salem Chapel, Market Rd. 2, Pennant and Decorative brick, 22 Rectory Rd. 3, 4 Radyr Stone, Market Rd. 5, 6 Carboniferous Limestone with brachiopod and crinoids, 126 Wyndham Crescent. 7,8 Reddened Carboniferous Limestone with fossils, 24 Turberville Place.



Figs 9,10, Sweldon Limestone, 43-47 Glynne St. 11, 12, Carboniferous Limestone with fossil, Canton Cross.13, 14, Lias Limestone with fossil shells, 53-55 Llandaff Rd. 15, 16, Unidentified limestone, side walls of Amberley House, Severn Rd.



Figs 17, Ballast terrace, 47-51 Llandaf Rd, 18, Ballast Work, Wyndam Crescent. 19–24, examples of ballast 19, garnet schist. 20, coarse grained pink granite. 21, fine grained granite. 22, lava. 23, red sandstone. 24, fossiliferous limestone.

25, 26, Cobble cottage, 42 Severn Grove. 27, 28, Purbeck limestone with Neomiodon shells, Clive Rd. 29, 30, Quarella in frieze, 42–46 Romilly Rd. 31, 32, Forest Pennant in quoins of 88 Llandaf Rd.

building with ecclesiastical buildings having a more detailed record than everyday dwellings. Two examples are given here:

Sweldon Stone is a limestone that was formed at the floor of a shallow/deep sea during the Carboniferous period around 359 million years ago. It is made up primarily of calcium carbonate in the form of small grains (less than 2 mm) and zones of fossils. Most common are the disaggregated remains of crinoids (sea lilies) but the shells of brachiopods are also seen. The fossil material was winnowed and concentrates into layers by current activity. Discontinuous chert bands or nodules may also be present and are characteristic of this stone. Chert is a form of microcrystalline silica (SiO_2); flint is the most well-known form of chert. In both flint and Sweldon Stone the silica is derived from the dissolved skeletons of siliceous organisms. The limestone is a pale grey, frequently tinged a pale pink. The pink colour formed once the limestone has consolidated and resulted from precititation from iron-rich fluids .

It can be seen in a number of houses in Canton, particularly at 35-37 Market Rd (#19), 45-47 Springfield Place and 288 Cowbridge Rd end wall in Egerton St (#15). Elsewhere the stone was used in the reconstruction of Cardiff Castle, the extension to St Peter's Church and the construction of St Germans in Sun St and St James', Newport Road. Sweldon quarry was on the site now occupied by B&Q at Culverhouse Cross.

Radyr Stone is a breccia (a sedimentary rock). It contains angular fragments of white, brown and grey rock. It formed in a hot dry climate where occasional torrential rain led to flash floods. These carried rock debris along canyons ('wadis'), and deposited the debris as alluvial fans at their mouths.The deposit formed during the later part of the Triassic Period, around 210 million years ago. The pebbles were derived from older rocks and predominantly Carboniferous but also include older sandstones (pebbly, quartz rich and micaceous varieties) from Devonian rocks, which sit below the Carboniferous strata. Over time, the fragments, which sit in a background of quartz sand, were consolidated into rock by compressions and precipitation of calcium carbonate.

Radyr stone is widely used in Cardiff, on our walk it is well represented in Wyndham Road (#3) and in Market Road (#18). To get a close look examine the coping stones around Severn Road School (#25) where the stone is cut to reveal the variey of pebbles. Do not confuse the modern concrete copy close by.

One quarry Radyr, now a suburb of Cardiff, ceased working around 1908. More information and how to visit Radyr Quarry can be found at https://www.bgs.ac.uk/

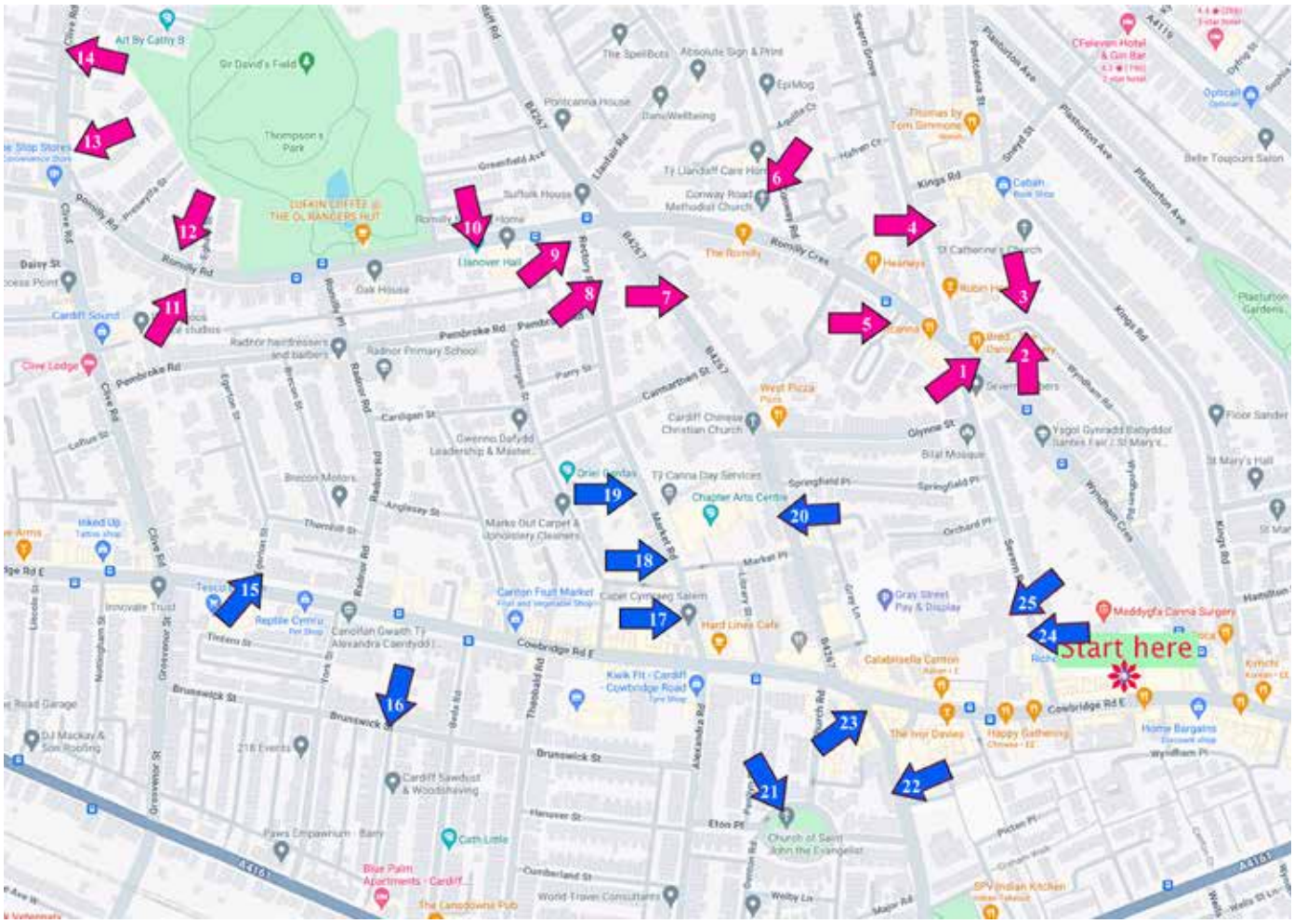


Fig. 33, Preliminary route of walking tour; outward via magenta arrows, inward via blue arrows

discovering-geology/maps-and-resources/office-geology/radyr-stone-quarry/.

The delivery.

We intend to the test the walk by leading groups of friends and using feedback to refine the information content. Once the content has been established we could continue to lead walks on an occasional basis but will investigate how best the walk could be made available as an on-line resource or a leaflet with links to on-line information. Hosting on-line information could be a challenge but printed leaflets have a financial cost.

We welcome any addition information and advice on developing this walk and hope that this can develop into an extension of the plan to revise and extend Perkins 1984 "Building Stones of Cardiff".

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Statue of Florence Nightingale

Michael Statham

In 1910 a statue of Florence Nightingale was placed in a niche on the top of the Glossop Road elevation of a new extension of the Cardiff Royal Infirmary built to house the Outpatients Department and accommodation for nurses, which is where it still stands. Doubtless due to the statue's extremely exposed position, it has not weathered well; the right hand and lamp it once held, and the left hand and a large part of the left arm are missing (Fig. 1).

The statue was commissioned by John Lynn Thomas C.B., a surgeon at the Infirmary. According to an article in the Western Mail in 1910, which included a photograph of the statue, it was modelled at the studio of Goscombe John and finished at the workshops of William Clarke in Llandaff. However, according to a record in Clarke's archive (Clarke, W., 1910) the modelling should be credited to L.S. Merrifield, who later sculpted the statue of William Pantycelyn for Cardiff City Hall. The statue of Florence was carved from Hollington stone by architectural sculptor William Willingale Taylor. It was delivered to the hospital on 5 August, just a few days before Florence Nightingale's death on 13 August, and was fixed in position on 30 September. Dr Thomas was billed £25 for Clarke's work on the project.

Figure 1 Statue of Florence Nightingale, Cardiff Royal Infirmary Glossop Road, Cardiff © Michael Statham.

A photograph of the statue prior to its erection, similar, but not identical to the one published in the Western Mail, survives in the archives of W. Clarke, Llandaff, Figure 2. Hollington stone is a Triassic fine to moderately coarse sandstone quarried in Staffordshire. Colours range from cream or 'white', to pink, red and reddish brown. It has been widely used in the UK including St Asaph Cathedral (Marr, J.E., 1910) and is still available in several colours.

Figure 2 Photograph of Statue of Florence Nightingale (1910) © W. Clarke, Llandaff.

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Stone dressings from the Cistercian Abbey of Strata Marcella, Montgomeryshire

John Davies

The Cistercian Order was first encouraged to establish monasteries in Wales in the first half of the twelfth century, after the Norman Conquest. In the south, the first established were at Tintern, Margam and Neath built by the Norman lords of Glamorgan. In the north, the Norman Earl of Chester founded the monastery at Basingwork, Hollywell. In the west, the first Norman Bishop Bernard encouraged the Cistercians to establish a monastery at Treffgarn in Pembrokeshire. Whilst the eastern foundations remained under the patronage of the Norman Marcher lords, in the west the return to power of the Welsh kings resulted in the patrimony being adopted by them. The Abbey of Treffgarn moved to Whitland in 1151 and the development of many daughter houses was encouraged by The Lord Rhys. All the western Cistercian Abbeys were patronized, firstly by the Welsh Lords and Princes of south Wales and then by the Princes of the north.

Location		Date
Strata Florida	Ceredigion	1164
Abbey Cwmhir	Radnorhsire	1176
Strata Marcella	Powys	1170
Llantaenam	Gwent	1179
Aberconwy [Conwy]	Gwynedd	1186
Cymer	Merionethshire	1199
Valle Crucis	?	1201

The abbey of Strata Marcella was established on the west bank of the river Severn at SJ 250103, 2.5 km north of Welshpool, by the Princes of Powys at a time of cooperation between its rulers and Llywelyn the Great of Gwynedd. It is visible from a layby on the A483 between Welshpool and Oswestry as uneven surfaces in the otherwise flat field east of the road.Similar to the abbeys at Whitland, Strata Florida and Abbey Cwm Hir, on the Dissolution of the Monasteries from 1539, the stone, and particularly the dressed-stone became very valuable to the local communities. The Abbey at Maenan in the Conwy Valley, the monastery displaced from Aberconwy by Edward I, suffered also at this time. The stone, and especially the dressed-stone was re-cycled into local churches, and mansion houses, by the local landowners

Fig.1 Plaque at the layby on the A483 next to the Strata marcella site. Fig 2. Strata Marcella Abbey site uneven surface in the fields.

and also used for renovating estate farms. There are examples of reused stone in the church porch at Llanfair Caereinion, and reputedly at Guildsfield and Pool Quay nearby. The font at Buttington church is also work from a hollowed out pilar capitol, and part of a pilar has been relocated (?19thC) to form a feature in the churchyard at Chirbury (Fig. 3).

During the 19th Century, Stephen Williams, the County Surveyor of Radnorshire, who was a skilled amateur archaeologist excavated the abbeys at Strata Florida, Abbey Cwm Hir and Strata Marcella. He produced the

Fig. 3. Column in the churchyard Chirbury, Shropshire.

first reliable ground-plans of each of them and excavated a number of blocks of dressed-stone from the sites.

Because there is no good freestone available across most of mid Wales, and Stephen Williams'ability to recognise some of the building stones, he was able to match the stones of Abbey Cwm Hir with the Triassic 'Grinshill' Sandstone of the Shropshire basin. Until the establishment of the Welsh Stone Forum, these identifications were accepted by most of the authors and those interested in these sites.

Firstly, see previous WSF Newsletters, it was realised that the dressed stone at Abbey Cwm Hir, whilst undoubtedly being sourced from the Triassic outcrop in mid Shropshire, it did not match the Helsby Sandstone at present seen in the Grinshill Stone-quarries. In WSF Newsletter, No.19 , the evidence appears to suggest, that the dressed-stone from Abbey Cwm Hir was quarried from the sequence overlying the Helsby Sandstone (the current name for Grinshill Ston) known as the Tarpolly Siltstone Formation.

The only network of roads which linked Grinshill and Abbey Cwm Hir lay through Shrewsbury, across Long Mountain and Kerry to the Abbey and passed through Chirbury. It thus was naturally of interest to search out and examine any stone which could be associated with Strata Marcells in order to ascertain if that abbey had sourced the same material.

There were two questions which had been considered before the present investigation by members of the Forum. The first of these, was the colour of the stone in the porch of Llanfair Caereinion, which was more orange coloured than the stone at Abbey Cwm Hir. The second consideration was the direct road routes to Strata Marcella from mid Shropshire, which might lead to the possibility that the source of the stone may well also be Triassic but from further north along the outcrop than that at Cwm Hir from Grinshill.

After the publication of our findings concerning the stone at Abbey Cwm Hir last year, the idea that some of the stone excavated by Stephen Williams from Strata Marcella may have been incorporated into the collection of artifacts and materials in the Powysland Museum at Welshpool became an idea worth pursuing. A contact with the curator confirmed that there was a considerable collection of the stone in the museum store from Stephen Williams' excavation, and members of the Stone Forum would be welcome to examine them.

The opportunity was arranged for a small group including Jana Horak, Andrew Haycock, Graham Oliver and myself to examine the collection on 2nd February 2024. In addition, Jeff, the husband of the Vicar of Buttington,an architect connected with historical buildings, also was in the party.

The material was examined, recorded and photographed in suitable detail and a number of conclusions which helped to clarify some of the ideas concerning the sources and routes of some of the dressings of the Abbeys of med Wales.

The party then visited All Saint's Church Buttington, a few kilometres to the north-east of Welshpool, to examine the font, before moving on to the pillar in St Michael and All Angles, Chirbury churchyard (10km to the south east). Unfortunately, the light was not so strong at the latter stop and detailed study was consequently more difficult.

The initial possibility that the stone dressings at Strata Marcella, like Abbey Cwm Hir may have been derived from Grinshill, since our examination of the dressed stone in the museum seems to make it much less likely that both abbeys received stone from the same source, and the doubts expressed above, appear to have been confirmed.

The conclusion that the font at Buttington Church was initially part of the derived stoned from Strata Marcella Abbey, as local tradition suggests, appears to have been confirmed. However, more detailed examination of the pillar in Chirbury churchyard, on previous occasions would suggest that it is much more like the stone at Abbey Cwm Hir and consequently, that it is more likely to be from the Tarpolly Siltstone Formation of Grinshill.

It is also apparent that the stone for Abbey Cwm Hir, would have been carried directly from Grinshill, over Long Mountain along a direct route, and that the stone for Strata Marcella appears to have more probably been carried along a direct route from the Triassic outcrop further north in Shropshire.

The project has helped to clarify the links between the various 'Welsh' Cistercian houses and the sources of their main dressing stones. Whitland Abbey predominantly used Dundry Stone from Bristol, Strata Florida Dundry Stone and Malltraeth Sandstone from Anglesey. Cymer Abbey used Egryn Freestone locally from Merioneth. Aberconwy used Namurian sandstone from Bodysgallen, Llandudno. Glyn-y-groes [Valle Crucis] used Namurian, Cefn Sandstone. Strata Marcella appears to have used Tiassic Sandstone from Shropshire possibly from the area where the Stone Forum visited on the previous trip to Shropshire (Autumn 2023, see Newsletter 19) and Abbey Cwm Hir used a sandstone of the Tarpolly siltstone Formation, probably from the Grinshill outcrop. Llantarnam Abbey appears to have used Jurassic limestone from the Cotswold escarpment.

The further detailed understanding of the geographical variation in the petrography of the Triassic Sandstones of the Shropshire Basin will help to refine further the location of the sources of these dressings. The following information has helped considerably in this project.

London Welsh: St Luke's Church in Kentish Town

Ruth Siddall

In the 1860s, the original church of St Luke's, in the London Parish of St Pancras was slated for demolition to make way for the new St Pancras railway station. This happened in 1868 and a compensation payment of £12,500 was made by the Midland Railway Company to the parish to pay for the construction of a new church in 'New' Kentish Town, now in the London Borough of Camden (Fig. 1). In addition to the compensation payment, the parishioners raised further funds thus providing what was then a handsome sum in excess of £14, 000 for building costs and architect fees. The then encumbent of St Pancras Church, the Reverend William W. Champneys proposed his son, Basil, as the architect for the new building (the reaction of the parish council is not recorded). Basil Champneys (1842-1935) was then an unknown and untested architect and newly qualified. In 1867, he had set up his own business in London, having returned from Wales where he had learned his craft under the guidance of the architect and Surveyor of Llandaff Cathedral, John Prichard. Champneys went on to become one of the most celebrated architects of the later 19th and early 20th Centuries, but this church was his first commission and his tutelage at Llandaff was definitely influential in his approach to the design and build of the new St Luke's and particularly in his choice of building materials.

Given the circumstances of this commission and the funds available for construction, Champneys undoubtedly found himself under some pressure to do a good job and to ensure minimum mishaps, he chose to work with Thomas Williams of Llandaff, contractor to Llandaff Cathedral and someone with whom Champneys would have worked with in his previous role. Champneys and Williams also chose to use south Welsh stones in the construction of the church, again presumably because they were familiar with their properties and availability. Building was underway by November 1868 and the foundation stone of St Luke's was laid by the Prime Minister, Benjamin Disraeli.

Fig.1. St Luke's Church, Kentish Town.

As ever, contemporary reports of the construction materials in trade newspapers have been of immense help (and occasionally a hindrance) in identifying the stones used in this building and indeed precipitated the visit by the author to St Luke's to examine the fabric. The Building News (Anon., 1870a) is most useful in telling us that Champneys chose red Suffolk brick with dressings of Tisbury (Chilmark) Stone as the main materials used for construction. However, the interior stonework is Bridgend Sandstone (Quarella Stone) and the columns are of Radyr Stone. These stones are uncommonly found in London. According to Elsden & Howe (1923), Quarella was used for the construction of 'the Royal Colonial Institute [Royal Commonwealth Society] and St Luke's Church'. The former building, located on Northumberland Avenue in the City of Westminster, was largely destroyed during the Blitz. The author is unaware of any other uses of Radyr Stone in London. At St Luke's, Quarella Stone is observed on the church's exterior in the two groups of three colonettes flanking the main doorway (Fig. 2). Inside it is used for the chancel arch and dressings in the choir and east-end apse, including the sedilia and its associated colonettes. Monolithic cylinders of Radyr Stone are used for the two rows of aisle columns, but these are painted white. Indeed during construction, the Holborn Journal (Anon., 1869) reports that in the interior of the church, the arches will spring from 'a row of short white columns' implying that the raw surface Radyr Stone was never intended to be part of the design. Nevertheless the distinctive texture of the conglomerate can still be discerned through the painted surface and categorically confirms the identity of this stone (Fig. 3).

Radyr and Quarrella Stone are reputedly used in the construction of the pulpit (Anon, 1870a), but no trace of these stones can be seen there today.

Other decorative stones are to be found in the interior of the church, which, to the knowledge of the author, have not been described or identified elsewhere. The panel above the altar on the east wall is constructed from five plain but quarry-matched slabs of Swedish Green Marble

Fig. 2. The SW Door of the church with columns of Quarella Stone.

Fig. 3. Traces of the conglomeratic facies of Radyr Stone, used for the aisle columns, discerned through the layer of white paint

(from Kolmården, Sweden) in a framework of white, Italian, Carrara Sicilian Marble. This is itself framed by a border of serpentinite marbles; Thessalian Verde Antico beneath the panels and a variety of Verdi Alpi on the other three sides (Fig. 4).

The font was constructed by a specialist firm in mosaic and decorative stonework, Burke & Co. of Regent Street (Anon, 1870a). It is built of French stones popular at the time; the octagonal bowl is constructed from a single block of Napoléon Melange, one of the Boulonnais Marbles, Lower Carboniferous limestones from the Ferque Inlier in the Pas-de-Calais. The decorative inlay, stem and plinth are of Rose Vif, a Devonian, pink nodular limestone from St Girons in the Ariége (Fig. 5).

Fig. 4. The East Apse of St Lukes. The chancel arch and dressings in the apse are of Quarella Stone. The marble panel behind the altar is constructed from Swedish Green Marble, Carrara Marble and various serpentinites. The piscina can be seen on the right-hand wall.

Finally, the frame of the piscina, located on the east apse wall to the right of altar, is constructed of a stone well-known to the readers of this Newsletter and needs little further description. It is made from Penarth Alabaster, surely again the choice of Thomas Williams of Llandaff and this feature at St Luke's Kentish Town is a new identification of the use of this stone in London. Penarth stone is distinguished from the more commonly used English Alabaster (Tutbury Gypsum Beds) in that it is distinctly rose-pink in parts and speckled by orange-brown 'liver spots'. The stone used here varies in colour from rose pink to grey (Fig. 6).

Much of the Chilmark Stone (the inland outcrop of the Portland Stone Formation in the Vale of Wardour) used in the building's exterior has weathered poorly and has been limewashed or replaced by cast concrete and other stones, the latter is unfortunately above eye level which hinders identification. The Builder (Anon., 1870b) also states that in addition to Chilmark Stone, Hollington Stone was used in the construction of St Luke's, but this distinctive Lower Triassic Sandstone has not been observed in the fabric of the church.

St Lukes Church is located on Oseney Crescent, Kentish Town, London NW5 2AT, Grid Reference TQ 2949 8492. Further information on the history and consecration of the church is provided by Jolly (2020).

I am grateful to Michael Statham of the Welsh Stone Forum for alerting me to the article in The Building News relating to the fabric of St Luke's Church. London Churches inevitably being locked for most of the time, I am indebted to Evie Jones, Team Administrator at St Luke's, for allowing me to visit the interior of the church on 22nd August 2023.

Fig. 5. Detail of the inlay work in Rose Vif on the font. The bowl of the font is constructed from Napoléon Melange.

Fig. 6. The piscina, constructed from Penarth Alabaster and close-ups of the stone used.

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Field Trip Reports

Laugharne 20th May

John Shipton & John Davies

On a warm sunny Saturday morning in May Stone Forum members assembled in the car park below Laugharne Castle where our leader for the day John Davies explained that Laugharne sits ‘’well and truly on the Old Red sandstone’ (Milford Haven Group) outcrop. He went on to say that although most of the castle is built using a greenish sandstone there is none found in the immediate vicinity. The stone is from the Senni Formation (Lower Devonian) that is found on the opposite, east side of the Taf-Tywi-Gwendreaeth estuary, in the Gwendraith Valley. This is a good building stone because it is compact and is generally, naturally-jointed into rectangular blocks. In south-eastern Carmarthenshire, from east to west, the Carboniferous Limestone rests unconformably on progressively older members of the Old Red sandstone succession so that many of the potential building stones which outcrop further east are not accessable in the vicinity of Laugharne itself.

The first Norman conquest castle was of earth-and-timber, motte and bailey construction. The remnants of the first stone castle indicate the use of mostly maroon sandstones, from the Lower Devonian sequence, which can be seen in cliffs around the town. The later 13th century castle used the green-grey sandstones from the Senni Formation. (Fig. 2). Henry VIII's reputed illegitimate son John Perrot, was accused of carrying stone from Whitland Abbey after its dissolution to renovate his castle here.

Inside the Castle John explained that much Dundry stone, the Jurassic Limestone from south of Bristol had been taken from Whitland Abbey following the dissolution and transported to Laugharne, we would spend some time that morning looking for evidence of that Dundry stone. Some Ordivician shales and slate, were found, and John suggested that these could also have come from Whitland. A block of possibly re-used Dundry was found in dressings to a door jamb but few other examples were found.

Inspection of the dressings also identifed blocks of Doulting Stone (Fig 3), a Jurassic limestone from the Mendips, in the doorway dressings. A member of our group suggested that this rock could have been imported over the Somerset Levels to Lang Port which now lies far inland.

In quoins around a gate (Fig. 4), John also drew our attention to a grey gritty sandstone which he identified as ‘Pebbly Brownstone’, derived from higher in the Devonian sequence which had been transported from the area on the south-east side of the Gwendraeth valley. These pebbly sandstones are derived from the Caeras Member of the Brownstones Formation.

Fig 1. Laugharne Castle from the car park.

On the way out of the castle grounds we came across an interesting semi-circular timber bench which sat on a circular base set out in segments of different stone types. John Shipton informed the group that the bench had been made by Cadw joiners and was in memory of Richard Avent, Chief Inspector of Ancient Monuments in Wales who died tragically with his son in a diving accident near Greece. The segments of stone in the circular base are made up of fragments of stone types used in the construction of Richards favorite castles around Wales.

After lunch we moved on to St Martin's Church outside the town. The Chancel, Nave, Tower and transept are considered to have been rebuilt in the later C14th (Lloyd *et al* 2006), but with evidence of mid C15th, north porch and a storehouse probably of mid C17th. Restoration work was

Fig. 2a. Castle fabric composed of green Senni Beds and fine-grained red Lower Devonian sandstones.

Fig. 2b. Close up of fabric in Fig. 2a.

carried out between 1853-6 and 1873-4 (Dyfed Archaeological Trust record PRN 2163).

We found that the main body of the church was, like the castle, built using Senni Formation sandstones from the Gwendraeth valley and redder more local Old Red Sandstone, lithologies. The buttresses, however, were dressed with Caeras Member pebbly sandstones. This was also transported from the same Gwendraeth region. The Caeras Member occupies the lower half of the Brownstone Formation east of the Taf-Tywi-Gwendraeth estuary - and extends eastwards through southern Carmarthenshire to Carreg Cennen Castle, and was used extensively through that area for dressings such as Carreg Cennen Castle, Dinefwr castle and Cydweli Castle.

The colour of the Caeras pebble beds, varies from grey,

Fig. 3. Doulting Stone in the doorway to the Iinner ward. Dr Tim Palmer's hand for scale.

Doulting Stone

Doulting Stone is a Jurassic limestone which the WSF has encountered less frequently than Dundry Stone.It is derived from the Inferior Oolite Group (Middle Jurassic) with some of the best stone sourced around Shepton Mallet, Somerset. Palmer (2005) describes this stone as 'dominated by calcite bioclasts with a high preponderance of echinoderm debris' and that it is 'particularly resistant to weathering on exposed west coasts where the air tends to be salt-laden. Its mosaic of calcite crystals tend to be somewhat larger than those in Dundry Stone, and it weathers as well as a recrystallised Carboniferous limestone. It is let down only by locally-developed patches or thin laminae where the echinoderm debris is more sparsely distributed and where the blocky cement overgrowths did not develop'.

Palmer TJ (2005) Limestone petrography and durability in English Jurassic freestones. In: Doyle P (ed) *England's heritage in stone. English Stone Forum, Folkestone,* pp 66–78.

Fig. 4. Pebbly Brownstone quoins

green, and purple to red-brown and is generally strongly cross-bedding. The grain size is variable from coarse sand to pebbly sandstones with clasts up to more than 1cm diameter. The grain-size varies considerably vertically and laterally within the outcrop of this member. Locally to Laugharne the fine end of the formation is present, with the pebbles being smaller and less frequent and with a finer grain-size of the groundmass. In the rubble walls of the church blocks of Pebbly Brownstone containing quartz veins, were also noted, and John Davies explained that the quartz veins were typical of the Brownstone Formation in the source area.

Our next stop was St Mary Magdalene Church St Clears. Construction of the nave is attributed to the C12th (e.g. Lloyd *et al,* 2006), the chancel is probably of C13th and the west Tower later (C15th). Lloyd *et al* (2006) suggest that the chancel arch is the most significant piece of Norman architecture in the county. Restoration work was carried out 1853-5 and 1884-5. (Dyfed Archaeological Trust record, (PRN 3880)). Inside the church we found a large

Fig. 5a. Buttress at St Martins of Pebbly Brownstones blocks.

Fig. 5b. Close up of block.

font, probably C12th, but retooled. Tim Palmer suggested that this was probably a good quality Sutton Limestone, the design being typically early Norman. In the Nave we found a sandstone that John Davies considered to come from the Senni Beds . However, he did not think that it was the same rock as we had seen at Laugharne, earlier in the day. On the North side of the church Victorian replacement of the windows were noted to be worked from Bath Stone, and dressings to door jambs in the porch on the south side worked from Doulting Stone, seen earlier in the day at the castle.

Our final visit of the day was St Clear's Port, John Davies explained that St Clear's had a maritime history dating back to early medieval times when the Normans sailed up the river to consolidate their conquest. An on-site interpretation panel informed us that use of the port was continued into the C19th when vessels of up to 250 tons came up the river on the spring tides. Construction of roads and rail in the mid C19th led to the port's decline. However, the reason for visiting the old port was that Dundry Stone for the construction of Whitland Abbey probably came by sea via this route and up the river Taf to St Clears Port.

At nearly 3.30 John brought the meeting to a close and members thanked him for an interesting and informative field trip.

Fig. 6a (above) chancel arch in St Mary Magdelene Church, St. Clear. Fig. 6b (below) close up of pale greenish sandstone, of the arch. Andrew's sunglasses for scale.

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Drfed Archaeological Trust see: https://www.dyfedarchaeology.org.uk/wp/discovery/projects/churches/st-mary-magdalene-st-clears-carmarthenshire/

West Hereford, June 24th
ORS and Tufa churches of the ancient kingdom of Ergyng

Eric Evans
(with geological input from Jana Horák)

Geology and building stone resources

On the 24th of June 2023 members of the WSF met to visit four churches in villages to the north-east of Hereford on the west side of the River Wye. The sites visited are underlain by Lower Devonian sediments; Raglan Mudstone Formation (RMF), forms the lower ground, and contains a rare volcanic horizon, the Townsend Tuff Member, derived from volcanic activity to the west in ORD times. The RMF is separated from the overlying St Maughan's Formation (SMF) by the Bishop's Frome Limestone Member, a calcrete horizon. The SMF typically forms the higher ground.

The ORS sandstones of both formations are used as building stone (although those within the SMF are more abundant) as are tufa and the Bishop's Frome Limestone (BFL). Extracts from Newsletter 15, provide more details on the latter two lithologies. The BFL forms a contiguous mapable horizon, whereas tufa distribution is intermittent, controlled by the location of springs.

Much of Herefordshire's built heritage has been constructed using sandstones worked from the Raglan Mudstone Formation (RMF). The sandstones are sporadic throughout and were often worked from small delves which are now mostly overgrown or ploughed out. They are most commonly used for walling, and are purple, red, cream and striped sandstones. Where richer in mica the sandstones become flaggy. However, coarser white and grey sandstones are present and are often used as quoins. Notable horizons listed in the BGS memoir 198, are referred to as

- Lyde Stone (Pipe and Lyde, N of Hereford), 'drab' coloured (a dull heather colour)
- Luston Stone (N Leominster) 'drab' with grey mottling
- Witherington Stone (E of Hereford) coarse grained, brownish-grey, mottled, with rounded quartz pebbles and obvious cross-bedding.

The St Maughan's Formation (now formally referred to as Freshwater West Formation) includes sandstones and conglomerates suitable for building stones that are highly variable in colour and grainsize. The lithologies may be superficially similar to those of the Raglan Mudstone Formation, with some horizons quarried for dimension stone. Though not often occurring in continuous bands, the sandstones of the St Maughan's Formation are more abundant and thicker than those of the underlying RMF. These sandstones (and perhaps some of the sandstone bands within the Raglan Mudstone) are the principal sources of Herefordshire stone roofing 'slate'.

In general, the coarser beds tend towards a pale grey colour and these are the beds most often used for the main quoin stones and buttresses of churches and other large buildings. There are also medium grained, cream-coloured sandstones which often show stripes of purple-red (we have seen these before at Abbey Dore, WSF 15) but are usually a more uniformly darker red or purple colour, but also may occasionally be greenish-grey.

These two formations are distinguished from the pebbly Brownstones we have seen recently, which have a more uniform appearance, are commonly pebbly, and more chocolate-brown colour.

Quarries listed in literature (age of extraction unknown)

Bredwardine sits on Raglan Mudstone Formation (RMF) which includes minor sandstone horizons, such as that capping The Knapp.

Quarries -

- Westone Wood Delve (164286) Sandstone horizons within Raglan Mustone Formation
- Dorstone Hill (7368) St Maughan's Formation sandstone

Moccas sits on Ragland Mudstone Formation with Bishop's Frome Limestone Member present on the slightly higher ground 1-2 km to the west.

Quarries - St Maughan's Formation

- Byford Hill quarry (44883) Building stone and roofing tiles.
- Garnons Home Farm (44884) Building stoneKenowly Farm (44879)
- Mansell Grange (44882)

Introducution

All four of the churches visited sit within the ancient kingdom of Ergyng, once part of Wales but gradually becoming part of Mercia, and now within the county of Herefordshire, England. Madley and Moccas were once Celtic monastic sites established by Saint Dyfrig, perhaps the most important of the early Christian leaders in the 5th century, and grandson of Pebio, king of Ergyng. There are several other dedications to Dyfrig within Ergyng and a few further east around Weston-under-Penyard near the Roman site of Ariconium. There is evidence that St. Andrew's at Bredwardine and St Peter's at Peterchurch were also early Celtic foundations, but all four churches, as is the case with so many others rebuilt under the Norman reformation, have had their original dedications replaced with those of Roman (biblical) saints.

St. Andrew, Bredwardine

The first stop was at the early 12C century church of St. Andrew, Bredwardine. Bredwardine. This sits on Raglan Mudstone Formation (RMF), which includes minor sandstone horizons, such as that capping The Knapp. The fabric iat St Andrew is mostly of ORS, predominantly red-brown in colour but also greenish. Many of the quoins are in tufa (Fig. 1) and this stone is also used as window dressings on an early window to the east of the porch. The ORS was quarried locally while the tufa may have come from nearby Moccas. The arch (Fig. 2) of the north door is also in tufa, the ORS lintel is intricately carved with a "sheela na gig" figure similar to that present in St Mary & St David, Kilpeck. Internally herring-bone masonry is visible in the lower courses of the north wall (Fig. 3).

Fig. 1 Tufa quoins with green and purple sandstones from the St Maughans Formation St. Andrew, Bredwardine.

Fig. 2 Tufa dressings, doorway, St. Andrew, Bredwardine.

Fig. 3 (above) Herringbone masonary, St. Andrew, Bredwardine. Fig. 4 (tip right) St Michael and All Angels, Mocca, fabric of tufa blocks. Fig. 5 (middle right) Detail of yufa blocks show in Fig 4.Fig. 5 (Bottom right) St. Maughan's Formation dressings and tufa block fabric, St. Andrew, Bredwardine. .

St Michael and All Angels, Mocca

The group then moved to St Michael and All Angels, Moccas, which sits on Ragland Mudstone Formation with Bishop's Frome Limestone Member present on the slightly higher ground. The church, dating from the early 12th century, has a pleasing aspect incorporating a rounded Norman apse. It is generally supposed that this building dates from 1166 to the same plan and by the same builders of Kilpeck. Unusually the entire fabric is of tufa with the later window dressings in the nave and chancel in ORS. The church is roofed in red-brown stone tiles probably from the SMF. The stone effigy of a knight is dated to the early 14th century but has been so excessively cleaned that we were unable to identify the stone.

Church of the Nativity of the Blessed Virgin Mary, Madley Church of the Nativity of the Blessed Virgin Mary, Madley was the third stop. The bedrock at Madley is Raglan Mudstone Formation, but extensive outcrops of Bishop's Frome Limestone Member are present to the south-west. Only the porch dates from the 12th century while the tower and nave are 13th century. The fabric of the latter is of fine grained, weathered ORS but the quoins remain sharp edged and are of a grey colour and cross bedded coarse sandstone (Fig. 7). These cross bedded sandstones may be the Witherington stone mentioned above. Discarded roof slates were identified as Pembroke green slate (Fig 8).

St. Peter's Church, Peterchurch

The final stop of the day was St. Peter's Church, Peterchurch. Peterchurch lies further to the west and sits on Raglan Mudstone Formation, with St Maughan's Sandstone on the higher ground to east and west. Between these formations the Bishops's Frome Limestone is again present and forms a wide outcrop.

Fig. 7 (top) Fabric Church of the Nativity of the Blessed Virgin Mary, Madley. Fig. 8 (bottom). Fragmwent of green Maenchlochog, Pembrokeshire slate from the roof

The majority of the church is 12th century while the impressive tower dates to the 13th century. Both are built of ORS while the quoins of the tower are in coarse grey sandstone as seen at Madley (Fig. 8) . The arch of the small south door is intricately carved also in ORS. We were able to go inside and examine the Norman font which is made from Bishop's Frome limestone (Fig. 9 & 10).

Fig. 9 & 10 Font worked from nodular (calcrete) Bishop's Frome Limestone, St Peter's Church, Peterchurch.

Red sandstones of the north Wales borders, September 23rd & 24th

Andrew Haycock

On a very pleasant weekend in late September, members of the WSF met at Ruyton XI Towns in Shropshire to view the local use of Triassic sandstones, primarily from the Helsby Sandstone Formation. Sited geographically close to the Welsh border, these English sources have undoubtedly provided sandstone for Welsh building use. This was a two-day trip, the second day was allocated to investigating Carboniferous and Triassic age sandstones on the Welsh side of the border, not all of them being red, but more of that later. I am very grateful to Dr. Ruth Siddall for her input during the fieldtrip, and for additional details provided in this report.

Day One

The sandstones of north-west Shropshire were often employed locally; used as a freestone and rubblework for churches, chapels, farms, cottages and occasional manor houses. The sandstones were also used further afield, with known examples in Shrewsbury (e.g. Abbey Church,

Age		Stratigraphic Unit		Building Stone
Triassic	Anisian-Carnian	Sidmouth Mudstone Formation	Bollin Mudstone Member	Bollin Mudstone Sandstone
	Anisian	Tarporly Mudstone Formation		
		Helsby Sandstone Formation (HSF)		Eske Beds? Helsby Sandstone Nesscliffe Stone Ruyton Sandstone Shelvock Stone Grinshill Stone
	Olenekian	Wilmslow Sandstone Formation (WSF)		Wilmslow Sandstone

Summary Triassic stratigraphy and building stone names.

Church of St Mary the Virgin). Thomas Telford used sandstone from Nescliffe for Montford Bridge (1790-2) and 'Nesscliffe Stone' was also used by him to restore Shrewsbury Castle in the 1790s (Historic England 2023 Shropshire). Some of these freestone sandstones were prized by Victorian architects to achieve the polychromatic effects popular in architectural design at the time (Scard, 1990).

The local building sandstones were predominantly quarried from the Helsby Sandstone Formation (HSF) and include the vernacular stones, Nesscliffe, Ruyton, Shelvock and Grinshill, but other sandstones were also used. The HSF in this region certainly deserved our attention with a fieldtrip, as very similar red sandstones with distinct pale white mottling (some with veining) have been seen on previous WSF excursions to Powis Castle; Welshpool; St Ffraids, Llansantffraid; St Marys, Llanfair Caereinion and St Tysilio & St Mary's Church, Meifod

One example (on the October 2012 trip to Welshpool (see Newsletter 10), WSF members examined dressings at Christ Church and stone in the War Memorial at St Mary's. The stone in the war memorial could certainly be Hollington Stone from Staffordshire, as it was pale red, mottled, fine to medium-grained, with laminated and current-bedded blocks. However, close by in St Mary's church itself, numerous pale, salmon-pink and red blocks with 'Grinshill-type' veining were observed which on reflection are very similar to the stone seen locally nearby in Shropshire.

Helsby Sandstone Formation (HSF)

Described by BGS[1] as 'Fine- to medium-grained, locally micaceous, cross-bedded and flat-bedded sandstones. Sandstones are of fluvial (sub-angular to sub-rounded grains) and aeolian (well-rounded grains) facies. Pebbles may be common, particularly near the base of the formation'.

Famously pale white around Grinshill, similar pale coloured stone can be found in this region, but the sandstones here are predominantly much redder, with pink and red varieties, mottling is common throughout, as well as distinct 'Grinshill-type' veining.

Locally referred to as 'Ruyton Sandstone' after Ruyton XI Towns, it was also known as 'Shelvock Stone' and 'Nesscliffe Stone' depending on where the HSF was quarried. Each of the stones is a little different, so this was excellent opportunity for the group to view a variety of use and 'get their eye in'.

Petrological description (HSF)

In quarried outcrop and museum specimens, it can be seen to be a thick bedded freestone (sublithic arenite), red (Munsell 10YR 4 / 8) to red-brown in colour (10R 5/6), pink/orange, salmon-pink and pale-buff (approx. 2.5Y 8/3), often mottled, friable, with well-sorted, well-rounded grains, distinct 'speckles' of individual degraded feldspar, and discoloured 'patches' of quartz grains. Leisgang banding, red/orange grains and iron oxide granules can be observed in some outcrop and worked blocks.

Thin sections in the museum collection confirm a weakly cemented, well-sorted sandstone, with 15-20% pore space, a quartz-rich composition with sub-rounded to rounded grains, quartz-rich lithics and occasional plagioclase and microcline feldspar, rare mica, and iron oxide coating around grains.

Itinerary

The first stop of the day was at Ruyton visiting the C12 castle and St John the Baptist 'Church around the Cliffe'. The castle was very much in ruins, with much of the stone reused in the church. The site sits on Triassic age Wilmslow Sandstone Formation, with local small-scale outcrops around the village. There are also several quarried sources of Helsby Sandstone Formation (HSF) available nearby, including Dunning Wood Quarry to the east (SJ 4016 2251) and Grug hill quarry (SJ 3756 2321) to the west.

The rubble work of the castle was composed predominantly of rounded boulders from the glacial drift. This included Cefn y fedw sandstones and conglomerates, very likely from Sweeney Mountain approx. 12 km to the WNW.

The church (see Fig.1-right) was built predominantly from red HSF, with some paler, mottled (Fig.1 - bottom left) and veined blocks (Fig. 2). The group also observed distinct blocks with numerous gypsum nodules throughout (see Fig. 1 – top left). John Davies informed us that these units were likely quarried from the 'Eske Beds' at the top of the HSF.

The local Wilmslow Sandstone Formation (WSF) has also been employed in the church and local buildings.

This formation lies below the HSF in the Lower Triassic sequence. In worked blocks, the fine-grained sandstone (sublithic arenite) is brick-red in colour, quartz rich, with

Fig.1. Helsby Sandstone Formation (HSF) at Ruyton XI Towns - St John the Baptist 'Church around the Cliffe' (right), mottled (bottom left), nodular 'Eske Beds' (top left).

Wilmslow Sandstone Formation (WLSF)

'South of the Cheshire Basin, bright orange-red to dark brick-red, generally silty or argillaceous, fine- to medium-grained, micaceous sandstones with subordinate siltstone and mudstone beds. The sand grains are subangular to subrounded and pebbles are rare' (BGS1)

occasional feldspar (plagioclase and rarer microcline) and mica (muscovite and biotite). Nearby exposures in a road cutting were noted as cross-bedded and quite laminated. This stone is much more friable than the HSF, therefore more susceptible to weathering and interestingly, boring by masonry bees. Stone in a nearby barn was seen to be very friable and bored. Whilst not definite, the presence of masonry bee boring became a distinct characteristic to look out for throughout the morning.

Fig. 2 . Typical veined HSF at Ruyton XI Towns - St John the Baptist church.

The second stop was All Saints Church, Baschurch (SJ 4223 2188) with many different phases of building and restoration '*late C12, early C13, early C14 and early C15 work. It was restored in 1790 by Thomas Telford when the north aisle was demolished, and again by George H. Birch in 1885-6; further restoration in 1894. With large regularly coursed and dressed red sandstone blocks. The tower is early C13 to bottom four stages with chamfered plinth and string courses; stepped angle buttresses at north- west and south-west corners. Top stage with embattled parapet added c.1400' (English Heritage).*

The sandstone in the north wall was much redder than stone elsewhere in the church (Fig.3 – left of image). It was very fine-grained and occasionally veined. It was friably weathered and bored by masonry bees, but much less so than WLSF. This suggests that this is built in HSF from Nesscliffe. As mentioned above, Thomas Telford is documented as using stone from Nesscliffe for Montford Bridge around the same time (1790).

The tower and buttresses in the west of the church are of a much paler, veined and mottled sandstone (Fig.3 – foreground right of image). This is most likely the local Ruyton Stone, which is fine to medium-grained (occasionally coarse) and well to moderately sorted. Also evident here were occasional pale and laminated beds attributed to the Tarporley Sandstone (that sits above the

Fig. 3. HSF in All Saints Church, Baschurch: Left – red 'Nesscliffe Stone', right – paler and mottled 'Ruyton Stone'.

Fig. 4. Nodular, cross-lamination and veined HSF at Abbots Barn.

HSF) by John Davies. Inside, the carved font worked from the pale Grinshill variety of HSF, and this stone was also used in the doorway and window dressing in the exterior west end.

Ruth Siddall noted that replacement blocks are of Locharbriggs Sandstone from Dumfrieshire, an early Permian age aeolian dune sandstone. The presence of dark seams and speckles is very characteristic of this stone.

After lunch, and on the way to Location 3, we passed close to Grug Hill (Robin Hoods Chair) quarry in HSF, it was opened in the 1870s to build the nearby Ruyton Manor, and a light railway was built to transport stone from the quarry to the site. In 2014, architects renovated Ruyton Manor. (Andrew Arrol 2023, pers. comm. Sept). *'The vast majority of stone at Ruyton was in good order and hardly any of it had to be renewed. However, some of the parapet stones had to be replaced with Locharbriggs Stone.*

As Grug Hill quarry is on private land, we were unfortunately not able to visit on this occasion. We slowed down our cars to view Abbots Barn (previously Lowerhill Farm / Manor Cottages: Grid ref SJ 3733 2312) which is undoubtedly built from the same stone as the manor. We were very lucky to get talking to the owner of the property, who naturally asked us what we were doing! They very kindly invited us to inspect the stonework as close as we wished.

The HSF here is an intense red and veined, mottling is rarer, and some blocks exhibited nodules, lamination and cross-lamination. (Fig.4). The best quality stone was probably kept for the hall. As seen elsewhere, the 'veining', is the result of stronger cementation around grains, so when weathered, the stronger cemented grains remain raised. The stone was also observed in walling around the estate boundary. We also passed Shelvock quarry (SJ 3712 2361) in the HSF that is now unfortunately completely infilled. According to Scard (1990) Shelvock quarry provided thick beds of good quality, red and paler sandstone.

The third stop of the day brought us to Pradoe Church (SJ 3635 2482), near Eardiston village, where the nearby quarries; Copper Mine Plantation Quarry (SJ 3669 2470) and Shelvock Quarry worked sandstones in the Bollin Mudstone Member (BoM) and Helsby Sandstone Formation respectively. Pradoe Church was an '*Estate chapel built 1860-1 by Rhode Hawkins for Louisa Charlotte Kenyon; the chancel and north aisle was added in 1864. Snecked sandstone rubble with ashlar dressings. The Tower: In 2 stages with double-chamfered string course and diagonal buttresses to bottom stage at north-east and north-west corners. (Historic England / Pevsner 1958).*

The church turned out to be a lot more interesting than we had expected. On closer inspection, the pale coloured and pink/red sandstone, with dark to bright orange Liesegang banding, that I described in the field guide, turned out to be a lot more colourful than originally thought (Fig.5). The presence of purple, pink, green (malachite) and inky blue (azurite) can be attributed to local copper mineralisation. This colouring was concentrated in the stonework on the west side of the church. With known copper mineralisation and historic mining in the nearby Copper Mine Plantation Quarry, we can assume this stone was probably sourced there. Ruth confirmed that the presence of manganese oxide is probably contributing towards the purple - pink colour we observed in the stone, as manganese salts are often purple. She also noted that the stone in the south wall on the east side (chancel) was different, being nodular and flaser bedded, less weathered, with more raised 'Grinshill style' veining throughout.

A specimen from the quarry in the AC MW collection is

Bollin Mudstone Member sandstones (BoM)

This laminated reddish-brown and greenish-grey mudstone with siltstones. The lower part is a structureless and laminated, dominantly reddish-brown mudstone. Within the lower part of the member, a unit termed the 'Lower Keuper Sandstone' has been recognized in the Stockport area. This unit closely resembles the Tarporley Siltstone Formation of adjacent areas'. This BoM sandstone was probably only used very locally to the source.

Fig. 5. Colourful Bollin Mudstone Member sandstones at Pradoe Church.

Fig. 6. St Chad's Church: pale to red, mottled sandstone (HSF).

fine-grained, pale to salmon-pink in colour, friable, poorly cemented, quartz-rich, well-sorted with rounded grains, and with slightly pronounced veining. Black coatings are present throughout the specimen and concentrated in bands, is likely to be the result of manganese mineralization (possibly asbolane, romanechite or pyrolusite). Examination of a thin section of this lithology confirms this as a 'sublithic arenite, poorly cemented sandstone, with 25% pore space, sub-rounded to well-rounded quartz grains, very well sorted, with quartz rich lithics, and distinct pockets of carbonate cemented grains (possibly the original cement), rare mica, occasional plagioclase and microcline feldspar'

Although an internet reference[2] names Shelvock Quarry as the source quarry for the church. We can probably assume it is the later chancel and north side (1864) that is built in Shelvock (HSF), but the original church (1860-61) is built from the local Bollin Mudstone sandstones, and this is supported by the bright colouring (as a result of local mineralisation) evident in the stonework.

The final stop of the day was St Chads Church.

This was built in 1886 (SJ 3634 2482) near Haughton village (SJ 3732 2706). This is built from a pale to red, mottled sandstone with 'veining' throughout (see Fig.6). The sandstone is mostly massive, but some cross-laminated blocks were also observed. The stone is very likely to be HSF from the local quarries on the nearby Tedsmore Estate. There are two nearby, Pool Parva Quarry (SJ 3706 2668) just to the SSW, and Quarry Wood (SJ 3685 2618) a little further in the same direction. An internet reference[3] (West Felton Magazine) mentions that '*St Chads was built in 1886 by the Reverend T.M.B. Bulkeley Owen, of stone taken from the Tedsmore quarry'*. Whilst the exact location of Tedsmore quarry is not mentioned, Shelvock quarry is mentioned separately in the same article, it is therefore sensible to conclude the quarry to be Pool Parva or Quarry Wood, and Pool Parva is nearer to the church.

The old trackway from Pool Parva quarry to the church is now a footpath. After inspecting the stone in the church, a smaller grouper decided to visit the quarry to observe the HSF in outcrop. It made an interesting walk through an 8-foot-high corridor of corn/maze up to the quarry site. Mason tool marks were still visible on some of the quarried faces, and everyone agreed the stone looked to be an exact match to that seen in the church.

An excellent first day in the field, building up a picture of the variety of local use in Shropshire will certainly help us to identify similar stonework over the border in the future. The group returned to Wrexham for their accommodation, dinner and a welcome beer!

Day Two:

This day was organized to look at Carboniferous and Triassic sandstone use on the Welsh side of the border. We met at St Marys Church (SJ 3732 4182) in Overton, where we were very kindly offered refreshments with the congregation of the church after the morning service.

The church is built predominantly from Carboniferous age sandstones from the Salop Formation (previously known as Erbistock Formation) (see Fig.7 - left). The stone was also observed on a previous WSF fieldtrip in 2017 at Pen y Lan Church (WSF Newsletter 15).

In worked ashlar blocks, the sandstone was found to be fine grained, red brown (Munsell 10R 4/4) to purple in colour with grey green and pale mottling in part. Some

Salop Formation (Erbistock Beds)

Described by BGS1 as 'red and red-brown mudstone, and red-brown (mostly sublitharenite) sandstone containing beds of pebbly sandstone and conglomerate itself containing Carboniferous limestone and chert clasts, and thin 'Spirobis' limestone beds and caliche in the lower part of the unit'.

A thin section from a quarry in nearby Erbistock is observed to be a very fine-grained, well-sorted, crudely graded and laminated sublithic-arenite with quartz grains and quartz-rich lithic material, muscovite and biotite mica, iron oxide staining between grains, and occasional clinopyroxene and occasional mica-rich shale lithics'

Age		Stratigraphic unit	Building Stone
Triassic	Olenekian	Chester Formation	Chester Pebble Bed
Carboniferous	-Asturian-Cisuralian (Permian)	Salop Formation (previously Erbistock Formation)	Erbistock Sandstone
	Asturian	Halesowen Formation (previously Coed yr allt Formation)	Coed yr allt Sandstone
	Bolsovian	Cefn Rock	Cefn Sandstone
	Yeadonian-Langsettian	Gwespyr Sandstone [Formation]	Gwespyr Sandstone Aquaduct Grit
	Brigantian-Mardenian	Cefn-y-fedw Sandstone Formation	Cefn-y-fedw Sandstone

Summary of lithological terminolopgy and bulding stone names..

Fig. 7. St Marys Church, Overton: left - Salop Formation (Erbistock) sandstones, right – distinct carved figure in Salop Fm.

blocks exhibited some excellent cross lamination. Occasional blocks were quite muddy, and face-bedded blocks were seen to be weathering quite badly. Soft mud clasts were observed in some blocks, leaving voids where weathered out. The stone for St Marys Church would undoubtedly have come from one of the nearby quarries to the west near the River Dee, the nearest of those quarries being at Morris Wood (SJ 35725 42075). Viewing the stonework outside the church, some highly laminated replacement blocks were identified by Ruth as Wilderness Sandstone from Mitcheldean, Gloucestershire, a Devonian age fluvial sandstone from the Brownstones Formation. Although most of the church was built in local red Erbistock Sandstone, there was also some use of Cefn Sandstone and Bath Stone in dressings.

There were several monuments and sepulchral slabs inside the church that interested the group. One of the congregation members informed us that a Celtic or consecration cross at the bottom of one of the pillars was found face down in the tower (built around 1390). John Davies suggested this may have been part of a cross destroyed by Owain Glyndir. A distinct (possibly smiling) figure (see Fig.7 – right), appeared to be carved in a fine-grained, laminated, local pink Erbistock Sandstone. The remaining carved cross fragments were all worked from clay-rich Gwespyr Sandstone. David Roberts suggested that these were all carved at Valle Crucis Abbey. There are several Gwespyr quarries down the Dee valley that certainly provided stone for the abbey. On inspection, many of the floor slabs were also found to be of Gwespyr Sandstone, some of which were weathering quite badly. This is very likely to result from the clay-rich sandstone being used on a cold and damp church floor.

The columns inside the church are very pale in colour but look of a similar lithology to Erbisitock Sandstone. A broken fragment in one of the columns revealed the red colour, confirming that this was Erbistock stone. The lighter colour is considered to be the product of lime washing or a chemical reaction on the surface of the columns.

We then proceeded to **the second location** of the day: Bangor on Dee (SJ 3887 4540) to view the Parish Church of Saint Dunawd (C14) and Bangor Bridge (c. 1658). First up was the bridge, built in Carboniferous age, yellow Cefn sandstone and contrasting local red Triassic sandstones of the Chester Pebble Beds (see Fig.8). The bridge parapet was built of large individual blocks of Cefn, some with distinctly large Liesegang rings and iron nodules. These were also seen in Cefn Sandstone blocks at the church (See Fig.9 – top left).

Bangor sits on Triassic age, largely drift covered, Kinnerton Sandstone and Chester Formation. Wedd (1928) describes that *'outcrop of the Pebble Beds emerges from the Dee alluvium, and some sandstone possibly not far above the base has been quarried at the Craig, half a mile east of the village'*. This disused quarry can be found within Chester Formation sandstones at SJ 3957 4597. Some stone for the church and bridge very likely came from this location.

At the church, the group observed the use of Pebble Beds in the doorway and much of the church structure. As the

Fig. 8. Bangor Bridge in yellow Cefn sandstone and red Chester Pebble Beds.

name suggests, pebbles are common throughout the stone (see Fig. 9 – bottom left, bottom right). Occasional blocks are much paler (see Fig. 9 – top right), with voids where the pebbles have been weathered out. In the north isle of the church toward the northeast, the sandstone is finer and devoid of pebbles. David Roberts suggested that this is (Victorian or later) replacement in 'Abenbury Stone', the Salop Formation (Erbistock Beds) quarried near Kingsmill, Wrexham, just down the railway line from Bangor. Wedd (1928) mentions that this stone was also used for restoration work at Hereford Cathedral. Further Salop Fm stone with distinct orange and red grains, feldspar, mica, pale mottling and mud clasts was observed further round the corner on the east side. Cefn Sandstone has been used for window dressings, ashlar blocks and in the tower. Also present was the distinct grey-green Coed yr allt Sandstone (Halesowen Formation) which was quarried nearby to the west on the Wynnstay Estate, Ruabon. The sandstone is rich in lithic fragments, feldspar and mica. On a fresh surface, the colour is approximately Munsell colour white (5Y 8/1), light grey to pale yellow 5Y 7/2 - 7/4, with weathered surfaces a similar colour or darker. Ruth Siddall thought that a replacement stone with hummocky cross lamination was Corrs Hill Stone. Another rippled stone with 'iron shot' clasts which was also seen at Overton remains to be identified.

Chester Formation (Chester Pebble Beds)

The lithology is described by BGS1 as: 'conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone. The conglomerates have a reddish brown sandy matrix and consist mainly of pebbles of brown or purple quartzite, with quartz conglomerate and vein quartz. In these areas the formation generally fines upwards, from dominantly conglomerates at the base, to interbedded conglomerates and sandstones, with sandstone and pebbly sandstone predominant in the upper part, and rare mudstones'.

The English Heritage 2023 building stone atlas of Cheshire describes the lithology as: 'reddish-brown, medium to coarse-grained, cross-bedded sandstones, incorporating rounded quartzitic pebbles. These may vary in size, but rarely exceed 8cm in diameter. Sandstone beds with few or no pebbles also occur and 'millet seed' sand grains are common in the coarser, more mica-free sandstone beds'.

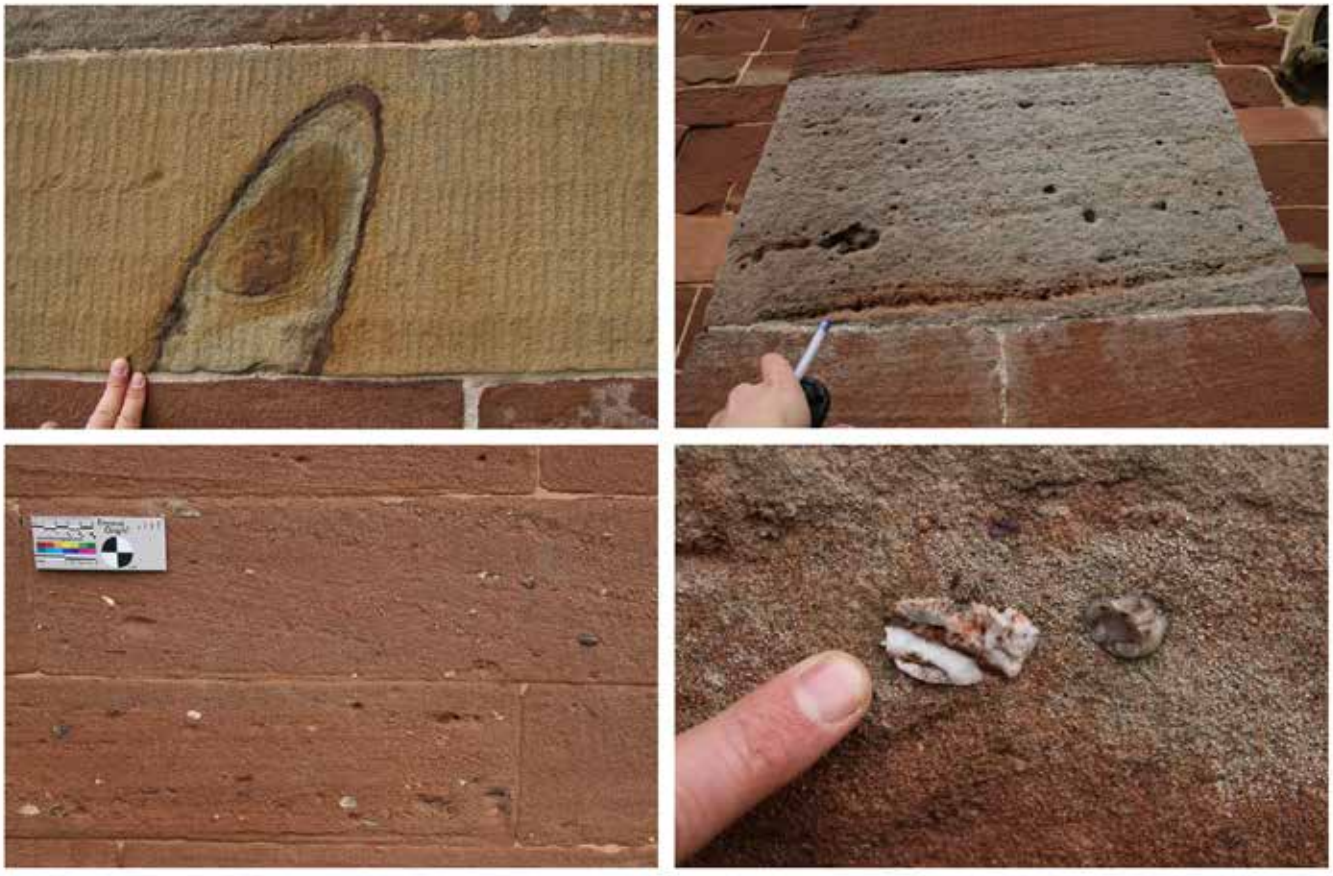

Fig. 9. Saint Dunawd Church, Bangor on Dee: top left - distinct Liesegang rings in Cefn Sandstone, bottom left - Chester Formation sandstone, top right – paler Chester Formation, bottom right – pebbles of vein quartz.

Cefn Sandstone

Described by BGS as 'massive, quartzose sandstone with subordinate and impersistent beds of mudstone and coal'. Cefn Sandstone has been widely used throughout the Wrexham region. With the advent of the railway in the C19, the stone was used much further afield than the local outcrop area (e.g. Liverpool, Manchester Birmingham, Aberystwyth, Cardiff).

It is a medium-grained, quartz-rich sandstone (lithic/ sublithic arenite) with feldspar, mica, dark lithic grains, and often with orange coloured iron 'speckling' throughout. It is pale yellow to yellow (approximate range Munsell 2.5Y 8/2 to 7/6) on a fresh surface. Feldspars often remain intact (cream-coloured to white), but where weathered the clay (kaolinite) tends to remain within the original feldpar 'footprint' (rather than in pore spaces between grains as in Gwespyr Sandstone). Weathered surfaces are yellow, buff to brown, with feldspar often still visible. Lithic mud clasts may occasionally be present, as well as plant fossil material. In buildings, Cefn Sandstone seems more susceptible to industrial pollution than Gwespyr Sandstone, with many stones exhibiting a very dark brown to black crust. Iron discolouration present as patches, banding, and dark brown concentrations as 'nodules', are common. Parallel lamination are observed in some worked blocks.

In thin section the rock is seen to be a moderate to well-sorted, quartz-rich sandstone, with rounded grains. The quartz is mostly monocrystalline and although some is polycrystalline. Muscovite and biotite mica, plagioclase feldspar are also present and lithics grains (polymineralic, mica-rich and quartz-rich lithics) are common throughout.

Gwespyr Sandstone

The Gwespyr Sandstone has also gone by the name Aqueduct Grit in the Wrexham area. Wedd (1927) describes the stone as 'a massive bed of more or less pebbly grit, containing interstitial kaolinised feldspar, and somewhat coarse-grained in the south (Trevor), but finer grained and less pebbly in the vicinity of Minera'. In the field, the sandstone (a subfeldspathic arenite) is found to vary from fine to coarse-grained, sometimes quite granular or pebbly. It is micaceous, and generally very well sorted, cream / yellow in colour on a fresh surface (approx. Munsell 2.5Y 8/3 - 4), and showing some obvious feldspar grains, and is rich in cream/white interstitial clay. Occasional very dark lustrous grains can be observed. Orange 'flecks' of iron staining are present throughout. The stone weathers to a buff yellow to grey colour with orange / brown iron discolouration. Iron discolourationis also present as coating to joints, as banding, and as Liesegang rings and 'nodules'.

After lunch it was on to the final stop of the day, Holt on the Welsh side of the River Dee, a stone's throw over the river is Farndon, Cheshire. The remains of Holt Castle (SJ 4112 5377) (c. 1282 – 1311) were built soon after Edward I granted the lands of Bromfield and Yale to John de Warenne. It sits at a prominent river position on and around quarried exposures of Chester Formation sandstone. This stop gave us an excellent opportunity to view worked stone alongside natural outcrop (See Fig. 10 – main image). Numerous pebbles were evident in the red castle stone, and quarried exposures exhibited some excellent cross-bedded sedimentary structures and mason tool marks. The castle is pentagon-shaped with a tower at each corner. Very little of the original castle remains today, just the central courtyard. A vast flat area of ground between the quarried faces, river and ruins remains. An excellent interpretation board gives visitors a sense of how big the castle actually was (see Fig. 10 – inset), it was massive! A huge amount of stone has therefore been removed and used elsewhere. The Duke of Grosvenor built Eaton Hall nr. Chester (1675-83) from stone brought down the River Dee from Holt Castle. The group looked for evidence of recycled castle stone in other buildings throughout Holt village, but nothing obvious jumped out. A smaller group also visited St Chads at the end of the day.

Fig 10. Holt Castle in Chester Formation sandstone, inset - interpretation board showing scale of original castle.

This weekend fieldtrip was an excellent opportunity to improve our knowledge of the Triassic and Carboniferous age sandstones used throughout the Welsh borderlands.

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3 https://www.westfeltonmagazine.co.uk (November 2023)

Gwent Levels II, October 21st

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This trip was the second visiting churches in the Gwent Levels and adjacent area and will be followed by a third trip in 2024. The project to look at medieval use of stone in the Levels was started by a request from the Living Levels project[1] for some information on the stone used at three specific localities. Three churches visited on this trip were selected to illustrate a range of stones in medieval times; two on the Gwent Levels at Redwick and Mathern, and a third (Holy Trinity, Christchurch).

Background Geology

The Levels are underlain by red Triassic mudstone (Mercia Mudstone Group [MMG]) which yields virtually no useful building stone. To the east of the area, the mudstone locally includes dolomitic limestone (Dolomitic Conglomerate= DC) and calcareous sandstone (Sudbrook Sandstone Member) which, although of limited geographical distribution, are valuable local building materials.

The higher ground to the north, east of the River Usk, is of Lower Jurassic strata; interbedded limestones and calcareous mudstones of the Blue Lias Formation (BLF), with the limestones forming usable building stone blocks defined by bedding and joints, referred to locally as Lliswery Stone.

The higher ground beyond the Jurassic strata provides further building stone lithologies. In the west is the Lower Devonian, St Maughans Formation (SMF) (which is referred to as the Freshwater West Formation in most recent BGS publications. It includes white quartz-rich sandstones and conglomerates at the base of the sequence, with purple and green sandstone horizons higher up. Further east various limestones of Carboniferous age occur, although these are less suitable for use in formal coursed stonework but provide rubble of in a range of colours (grey, pink, dull red and buff) and textures (fossiliferous and non-fossiliferous micrite).

Holy Trinity, Christchurch

The first stop of the day was Holy Trinity Church, Christchurch (ST 347 894), just north of the M4. Newman (2000) reports that the interior of this church was totally rebuilt by Pace after a fire in 1949. This followed a previous, restoration in 1864 by Seddon and again in 1877 after a fire. The trip therefore focussed on the exterior of the building. This unfortunately was partially enclosed in scaffolding but luckily this did not prevent examination of the key areas. The exterior preserves the medieval fabric. dominantly of perpendicular style (early C14) but with elements of Norman (C11-C12, south door), Early English (late C12 - chancel E window and wall, and base of tower) and decorative (mid C13 onwards - window W of porch) elements. Church House adjacent to the church is, probably late medieval, built in three stages, enlarged in C16 with work completed by c 1600.

The site sits St Maughan's Formation (mudstones) bedrock, which includes horizons of dull purple and green sandstones, and rubbly purple or green limestones (calcretes). The sandstone is locally flaggy. Lliswery Stone (BLF) outcrop lies less than 2km to the SE.

The fabric of the church is worked predominantly from St Maughan's sandstone (mainly purplish, but also some green and white) and Lias Limestone (Lliswery Stone) (Fig. 1) in the Early English phase of the tower and west nave. Blocks and quoins of of Sudbrook Stone (sandstone), Dundry Stone (Fig 2), Dolomitic Conglomerate (Fig.3), and calcrete (SMF)(Fig. 4) are also present, as is very minor tufa (Fig 6). The C20 restoration work is clearly identified by use of more orange Wilderness Sandstone (Brownstones Formation, Lower Devonian) (Fig.5). The Early English phase of the tower has dressings of Dolomitic Conglomerate (Fig 1), but other dressings of this phase (E chancel triplet window, doorway at W end of the nave Fig 5.) are of Dundry Stone, which is also for as the dominant dressing in the subsequent medieval phases. Bath stone was used in C 20 replacement of these dressings.

Phase	Locations	Stone fabric	Stone dressings
Phase 1- Norma	South Door (inner porch)	-	Dundry Stone
Phase 2 – Early English	Chancel, E wall triplet window remnant	?	Dundry Stone
	Chancel N window	St Maughans sst	Dundry Stone
	Tower lower stage	Foundation ORS & Sudbrook Lliswery Stone +/- DG, Sudbrook, ORS quoins.	Dol. Cong.
	Nave W end	Lliswery Stone	Dundry Stone (doorway)
Phase 3 - Decorative	2 light window W of S porch	?	Dundry Stone
Phase 4 – Perpendicular	Upper Tower	St Maugahns sst	? Dundry (tbc)
	Chancel	St Maughan sst, calcrete, quoins DG and Dundry	Dundry Stone
	N Aisle – W end	St Maughan's sst and DC	Dundry Stone
	N Porch- ashlar and doorway	Dundry Stone, Dol. Cong.	Dundry Stone

Table 1. Summary of stone used in different phases of building, Holy Trinity, Christchurch.

Fig.1 (top) Tower fabric of St Maughan's Formation purple and green sandstone interbedded with Lliswery Stone (Lias). Fig. 2 (middle) NE corner of chancel, St. Maughan's Formation sandstone with Sudbrook Stone and Dundry Stone quoins. Fig.3. Dolomitic Conglomerate with small clasts of Carboniferous Limestone.

Fig.6 (top). Quoin of grey calcrete showing characteristic nodular texture, sitting above a quoin of a Lliswery Stone (Lias) Fig. 5. (middle) Doorway at west end of nave, Dundry Stone, with 20th century infill of Wilderness Sandstone. Fig. 6. (bottom). Quoin of tufa (south-west end of chancel).

St Thomas the Apostle, Redwick

The group then moved south to the Levels. After lunch St Thomas the Apostle church, Redwick (ST 412 841) was visited. This is located on alluvium, with no stone source in the immediate vicinity. The church originally belonged to Tintern Abbey. The fabric of the church built at Redwick seen today is dominantly C13-C15, (predominantly Perpendicular but with Decorated elements) but may have C12 origins. Newman (2000) considers it one of the finest churches of the Levels. Restoration work was carried out by John Norton in 1874-5 (rebuilding of west wall and insertion of window). The church suffered WWII damage when the windows were blown out and the roof damaged. The tower is the earliest part of the church, as evidenced by the quoins of the lower stage continuing and intersect the eaves of the chancel, indicating it predates it (Newman, 2000). The nave and probably the chancel were built in the early C14 and the tower remodeled.

Building Stone

As the listed building citation reports the church is of brown-yellow, grey and buff stone (Cadw No 2940). The fabric of the church varies from well-defined to random coursed, with the dominant lithology used varying in the different components of the church.

The first stage of the tower is constructed from pink Carboniferous Limestone and odd blocks of yellow Dolomitic Conglomerate and Lias limestone (BLF), but two-thirds of the way up this fabric gives way to one exclusively of Lias Limestone. Subsequent stages of the tower are worked in Dolomitic Conglomerate with a red Carboniferous Limestone component, and there is a similar composition to the 3rd stage, although with a higher content of Dolomitic Conglomerate on some faces (e.g. north and east) (Fig. 7).

The chancel (C14) comprises coursed stone. The east wall has a base of substantial Lias limestone blocks, but this lithology gives way to a fabric dominated by red or ochre-coloured Carboniferous Limestone (Fig. 2). This fabric also makes up the south and north walls, although the north and east walls also have a small component of yellow Dolomitic Conglomerate. A few cut block of Bath Stone, are present at the base and half-way up the gable on the east wall. The quoins (on both SE and NE corners) are worked from large blocs (up to 80cm wide and typically 40cm high) of Dolomitic Conglomerate. The later buttresses are of grey-pale purple quartz arenite, tentatively identifiied as Tintern Sandstone.

The nave (C14) although suggested by Newman (2000) to be of similar age to the chancel, is constructed from regular coursework of Lias limestone (Fig. 7), with occasional red blocks of Carboniferous limestone. The west façade of the nave was rebuilt in the 19th century. There, the irregular coursework predominantly comprises cut Lias limestone blocks with occasional yellow dolomitic conglomerate, and maroon-weathered grey arenitic sandstone. It is not unreasonable to assume that this stone was derived from the original fabric, with the blocks mechanically recut.

The aisles are worked from coursed Lias limestone with a variable and sometime heterogeneously distributed component of red or pink Carboniferous Limestone

Fig. 7. South face of tower showing reddened Carboniferous Limestone (CL) and Lias Limestone (L) with Dolomitic Conglomerate (DC) quoins. Upper stages of DC with DC quoins.

Fig. 8 . East wall of chancel with Lias Limestone base and Carboniferous Limestone above. Window dressing and quoins Dolomitic Conglomerate.

Fig. 9. West wall with original DC doorway.

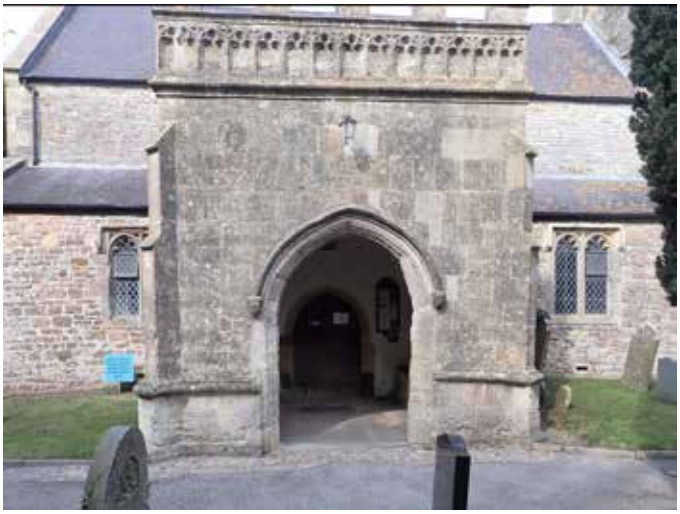

Fig. 10. Dundry Stone from west aisle doorway.

blocks (north aisle) or Lias with Dolomitic Conglomerate and red/pink Carboniferous Limestone. The west wall was ebuilt during restoration work (Fig.9). The window dressings are fashioned from a more varied range of lithologies than seen at other Levels churches.

- Dolomitic Conglomerate (DC)
- Dundry Stone
- Bath Stone
- Grey sandstone ('Grey Grits' = Tintern Sandstone).

It is not easy to determine a simple temporal pattern of stone use. However, it appears that:

- DC is probably the earliest used stone, as seen in the 1st Stage of the tower, and the Decorative style windows of the chancel on east and north facades.
- The nave windows, in perpendicular style, appear to be of Bath Stone, if so then the sandstone in the north windows reflect later (but historical) repairs.
- The aisle windows: several worked from grey quartz-rich sandstone (probably Tintern Stone) which can weather reddish, east of the porch one is entirely Dolomitic Conglomerate and one a mixture of Dolomitic Conglomerate and grey sandstone.
- The 19th century renovations were executed in Bath Stone, the west nave window being a total replacement.

The south porch,worked from Dundry Stone, is a later medieval addition (Fig.10).After inspecting the 1606/7 flood marker to the right of the entrance, we then made a brief visit to the interior of the church. The C13 font, which was retooled in the C19, has the form of a square bowl with scalloped edges. This is worked from Tintern Sandstone, which if original to the church would fit with its early association with Tintern The group stopped to examine two items in the churchyard; the socket of an early medieval cross, worked Sudbrook Stone and the coping stones to the boundary wall. These stones original from the C18-mid C19 and are molded from copper slag, probably from the Bristol area (Alen, 2001). Glassy slag is also found within south Wales as rectangular block used for footings and quoins.

St Tewdric, Mathern

The group then travelled east for the last stop of the day at St Tewdric, Mathern (ST 536 921). The church forms part of a group of buildings created by the bishops of Llandaff, comprising the adjacent palace, Moynes Court to the west, and this church. The oldest component of the church is considered the chancel where St Twdric's remains are supposedly buried. The earliest preserved part of the church is the W pier and arch of the N arcade which are probably C12. Reports of excavation of a similar pier further N might indicate an original Norman chancel (Newman, 2000). The nave, chancel arch and 4-bay nave are C13, but the building was significantly extended in the C15 with the addition of aisles and porch and a later C15 rebuild of the tower . The building was heavily restored in 1882 (Ewan Christian). The adjacent palace originally C15, was extensively demolished in 1770s, and restore in 1899.

Mathern sits on a bedrock of Triassic red mudstone (MMG) Dolomitic Conglomerate, with Carboniferous Limestone and minor sandstones to the east and west, and small outcrops of Sudbrook Stone and Dolomitic Congomerate. The river Wye lies just c 2km to the east, and the Severn Estuary 3km to the SSE, via the Mounton Brook.

Fig. 11. St. Tewdric, Mathern.

The dominant window dressings are of Dundry Stone, with C19 Bath Stone renovations and some grey/purple tinted or banded arenite, identified as Tintern Sandstone (Upper Devonian), used in the S aisle. Much of the fabric, apart from the tower, is of local stone rubble work. The 1478-96 expansion (aisles and tower) by John Marchall (Bishop of Llandaff) used Tintern Sandstone, which has a source 9km to the N, but with an accessible route down the Wye valley. Use of this stone perhaps reflecting the more grandiose aspiration of this phase of building.

The fabric of the chancel is a rubble work of locally derived, Carboniferous Limestone, showing various textures and colours, some dolomitic and quoins of large blocks of Dolomitic Conglomerate.

There are different combinations of stone on the N, E and S facades. The fabric of the C15 aisle is a pale quartz arenite, which may contain reddish chert pebbles, or pink stained quartz pebbles, some up to 20mm in diameter. Occasional blocks of Sudbrook Stone are also present. The windows dressing are of Dundry Stone, with one instance of a Dolomitic Conglomerate insert, and one window of pale arenite on E end wall.. The sills of the aisle are also of the same arenite, replacing Dundry Stone when the windows were relocated from the nave.

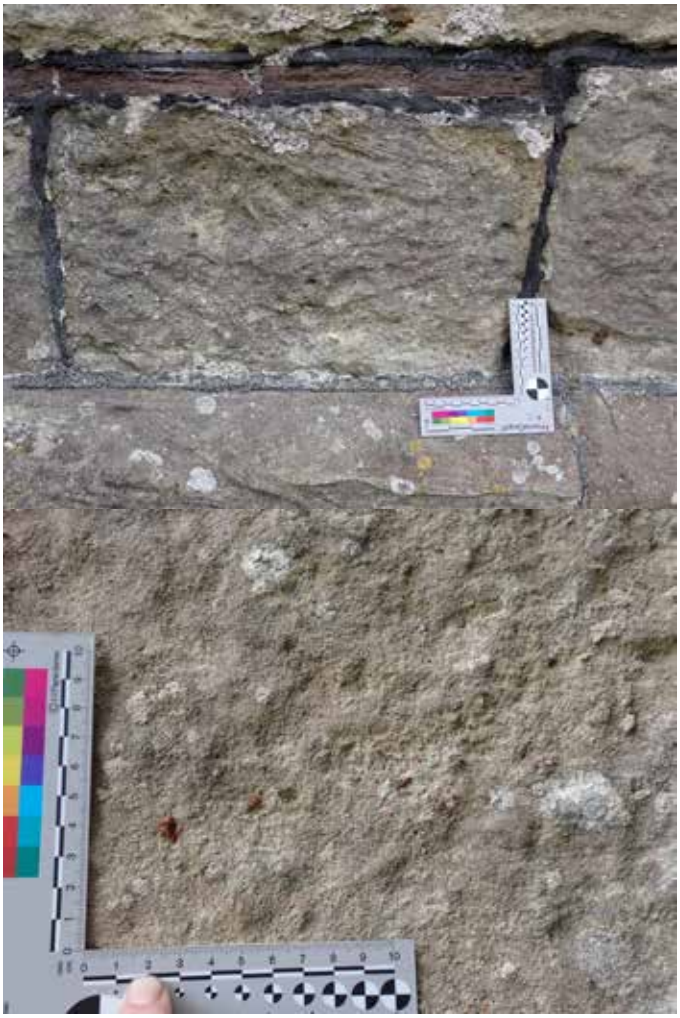

Fig. 12 (top) Squared blocks of Tintern Sandstone ('Grey Grits') in the tower. Fig. 13. (bottom) Close up of Fig 12 showing quartz-rich sediment with red chert pebbles.

Fig 14. Tintern Sandstone is seen again on the inside of the church. Pillars of grey/pale purple banded sandstones.

The nave aisle fabric is of rubble grey limestone and , Sudbrook Stone, with minor fine-grained red Sandstone (Devonian). This contrasts with the arenite used on the south aisle. All the dressings are of Dundry Stone, although the fabric around them suggests that they were added after the construction of the aisle (Newman, 2000).

The fabric of the tower contrasts with the rest of the church in being of squared ashlar blocks of pale, coarse-grained, well-sorted, quartz arenite, identified as Tintern Sandstone (Fig. 12). This shows both laminar and cross-bedding, locally with pebbles up to m10-20mm, mainly of quartz or red chert (Fig. 13). The dressings of the west door are the same as the fabric, but locally contains prominent sub-angular pebbles of red chert (<10mm). Re-investigation of the Tintern Sandstone in Tintern, has identified similar chert fragments, which supports this identification. The porch, both outer and inner doorway, are of Dundry Stone, with floor slabs of Devonian sandstone.

References

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