Fforwm Cerrig Cymru Welsh Stone Forum

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Welcome to the Welsh Stone Forum Newsletter 19. This is the first hard copy version we have produced since 2021. We hope that with care we can put Covid-19 behind us now and work to resume activity in building stone in Wales. The programme for 2023, has been advertised through e-mails from Andrew Haycock (Treasurer) and Mike Statham (Field Secretary). if you have not received any of these messages and updates, please contact Andrew (andrew.haycock@museumwales.ac.uk, so we can update our contacts database.

Our original programme for 2023 has been slightly rearranged as our Chair Dr John Davies, has undergone planned surgery, which has put him out of action for a while so has not been able to plan and lead fieldtrip. We wish him well and look forward to seeing him back in action.

Although we plan the programme towards the end of the year, we are happy to hear about active projects or proposals for field visits at any time. Please contact Mike Statham with your suggestions. Ideally we like to visit sites and exposures where there has been some recent research or investigation, however, we are also happy to help and active projects by providing geological support. Contact Jana (jana.horak@museumwales.ac.uk) or Andrew (as above) 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. Steve Howe our current Newsletter Editor, will be standing down after issue of this Newsletter, so please send your article until further notice to Jana Horak (Secretary) at the e-mail address above. It is best if images are initially sent at a low resolution, if possible, as this facilitates access via e-mail. It is also important to consider the balance between the amount of text and the numbver of images.

Just a reminder to everyone that the Welsh Stone Forum is affiliated to the Geologists' Association. Through them we are able to obtain liability insurance for our field meetings. A requirement of this is that we comply with a field Code of Conduct and also record those attending meetings.

PROGRAMME 2023

We are providing details of the programme, mainly for the record as we are now well into our field meeting season.

AGM & Anual Lecture 2023

This was held on April 15th at National Museum Cardiff. The proposed relection of officers was postponed until the 2024 AGM, as there were few nominations for posts. If you would like to discuss contributing to WSF activity please feel free to get in contact.

The AGM was followed by the annual lecture, given by Dr Ruth Siddall, Forum member and author of *Natural Stone and World Heritage: The Castles and Town Walls of King Edward in Gwynedd.* In the afternoon we visited a visit to St John the Baptist church, in Cardiff city centre. A report of this visit will be provided in the next Newsletter.

May 20th: Laugharn Castle & St Clears Prior
Leader: John Davies

This provided an overview of stone use and evidence of stone reuse from Whitland Abbey (Leader John Davies).

June 24th: Examination of Old Red Sandstone in churches of the Welsh Borderland, in Herefordshire.
Leader: Eric Evans

Investigation of the use of ORD lithologies, sandstone, tufa and calcrete limestone in three churches.

July 22nd: Stone use in churches of the Gwent Levels.
Leaders: Graham Oliver & Jana Horak

This will build on the 2021 trip to the Levels, looking at stone use in medieval three churches of the Gwent Levels.

September 23rd & 24t: Building stone in NE Wales and Welsh / Shropshire Borders
Leaders: Andrew Haycock & Ruth Siddall.

This will include examining use of Denbigh Grits Formation

October date tbc: Pebbly sandstones of ther Monmoth-Abergavenny area.
Leader: John Davies

Use of pebbly sandstone from of the Old Red Sandstone, in the Monmouth-Abergavenny area,

Dr Ron Austin

It is with great sadness that we announce the death of a long standing member of the Forum, Dr Ronald Austin, in February 2023. Ron completed both a BSc and PhD in geology at Swansea University, then moved to Southampton University as a lecturer. His academic expertise was in microfossils, more specifically conodonts, and he had an extensive publication record in this field. On his retirement as Senior Lecturer in 1990s he was awarded Honorary Life member of the British Micropalaeontological Society . He returned to his native Swansea, engaging with and supporting a range of local societies across the arts and heritage.

Ron was a founder member of the Welsh Stone Forum, after its inception following the 2002 *Stone in Wales* conference. He was a regular participant in field meetings, and although he was unable to attend in more recent years he maintained contact with the Forum.

Ron made a valuable contribution to our knowledge of stone in Wales, through his knowledge of the Carboniferous strata and study of Mumbles Marble (Austin, 1999, Austin & Murray, 2001) and his guide to the building stones of Swansea. He had a continued interest in ornamental stone, both acquiring samples from stone suppliers and collecting fine works of pietra dura, some of which are now within the Amgueddfa Cymru, Museum Wales collections. Ron was a generous man with his time and knowledge and he will be much missed. His funeral at the Tabernacle United Reformed Chapel, Mumbles had the celebratory eulogies delivered by those who knew him well, and to this we would add out gratitude for his generosity with his time and knowledge.

Austin R.L. & Murray A. 2001. Mumbles Marble -An update. Minerva- Journal of Swansea History, 9, 87-89.

Austin, R.L., 1999. Mumbles Marble and its association with Swansea and district. Minerva- Journal of Swansea History, 7, 19-32

http://www.risw.org

Our thanks to Helen Hallesy for providing the image of Ron and background information.

The Gloddaeth Purple Sandstone and All Saints Church, Deganwy

Ruth Siddall

The Gloddaeth Purple Sandstone is a unit of limited outcrop which was primarily used for window dressings at Conwy Castle and a number of other Medieval buildings in the Conwy Valley region including Aberconwy House and Dolwyddelen Castle. As such it's a distinctive and important local building stone although one of somewhat restricted use. Although mainly found in pre-15th Century constructions, the quarries were reopened in the later 19th and early 20th Centuries for repairs to Bodysgallen House and Gloddaeth Hall (now St David's College) and also for the construction of All Saints Church, Deganwy (Fig. 1). The church represents the first 'new-build' using this stone for some 500 years and I was alerted to its presence by Michael Statham. Michael and I took the opportunity to visit the exterior of All Saints, Deganwy in September 2022 following the Welsh Stone Forum field trip to the Conwy Valley.

All Saints was constructed between 1897-1899 under the direction of the architect John Douglas (1830-1911). Douglas was a prominent and prolific local architect who was responsible for a large number of buildings in Cheshire and North Wales. Towards the end of the 19th Century, he was employed by local landowner Lady Augusta Mostyn to make major renovations to her home, Gloddaeth Hall, and to design and build the new church in Deganwy. Conveniently, Augusta Mostyn also owned the Bodysgallen Estate which includes a quarry in the Gloddaeth Purple Sandstone located 500m north of Bodysgallen Hall and this is the source of the stone that was worked for both the construction of All Saints (and also, apparently, for renovations to Conwy Castle). The North Wales Times (8th Jan 1898) states that the "*The Council passed a vote of thanks to lady Augusta Mostyn for her permission to take stone from Bodysgallen quarry for repairs to the castle*." Towards the end of the same year, The Llandudno Advertiser & List of Visitors (2nd Nov 1899) reported on the consecration of All Saints, Deganwy declaring that "*the walling is of local stone from a quarry at Bodysgallen and the chiselled work is of Manley stone*."

On observation, Michael and I confirm that All Saints, Deganwy is indeed built from Gloddaeth Purple Sandstone, although it is a more intensely coloured variety than that observed in the Bodysgallen Quarry the previous day. It is a coarse, cross-bedded gritstone with prominent dark red-brown iron oxide nodules. The window and porch dressings are of a buff fine- to medium-grained sandstone, again showing clear cross-bedding. The latter is a good fit for Manley Stone which is derived from the Triassic Helsby Formation and quarried at Manley in Cheshire. Unusually for the Cheshire sandstones which are generally red or mottled, this is a buff to white-coloured stone.

Fig. 1. All Saints Church, Deganwy.

The Gloddaeth Purple Sandstone outcrops in an isolated basin (the WSW-ENE trending Gloddaeth Syncline) on the Creuddyn Peninsula to the south-east of the town of Llandudno. These continental sandstones, representing fluvial channels, unconformably overly the Asbian Loggerhead Limestones of the Clwyd Group. Analyses by palynologists at (the then) Robertson's Research company (unpublished, but cited in Davies *et al.*, 2011) found the fossil miospores *Dictyotrilites bireticulatus, Endosporites globiformis* and *Crassispora kosankei* in these otherwise barren sandstones, which therefore assign them to the Early Pennsylvanian Warwickshire Group, rather than the Mid Pennsylvanian, Upper Westphalian Coal Measures as previously assumed. The Bodysgallen Estate quarry, located at SH 79853 79581, exposes a ~ 10 m high face is exposed revealing medium to coarse-grained, well cross-bedded gritstones. These are predominantly buff coloured, but red and purple beds occur as well as scatters of iron-rich speckles and some prominent iron oxide nodules.

References

Davies, J. R., Somerville, I.D., Waters, C. N. & Jones, N. S., 2011, Chapter 8. North Wales., in Waters, C.N., Somerville, I.D., Jones, N.S., Cleal, C.J., Collinson, J.D., Waters, R.A., Besly, B.M., Dean, M.T., Stephenson, M.H., Davies, J.R., Freshney, E.C., Jackson, D.I., Mitchell, W.I., Powell, J.H., Barclay, W.J., Browne, M.A.E., Leveridge, B.E., Long, S.L. & McLean, D. (Eds)., *A Revised Correlation of Carboniferous Rocks in the British Isles.* Special Report No. 26 The Geological Society, London., 49-56.

Mona Marble

Mike Statahm

Mona Marble, a green or dark red serpentine (a variety of metamorphic rock) occurs in two areas, in Anglesey; on Holy Island and on the northwest coast (Greenly, 1920). This is not to be confused with Penmon Marble (also known as Anglesey Marble) which is a limestone of Carboniferous age and thus a sedimentary rock and not a true marble. There is documented evidence of Mona Marble being worked during much of the 19th century, and a suggestion that it was also worked earlier than this. In the early 19th century, its use was promoted by George Bullock, when more exotic stone imports were reduced at the peak of the Napoleonic Wars. Further details of its properties and use are provided by Horak (2002) and images of the marble from the northern occurrence are provided by the local community website http://www.cymdeithashanesmechell.co.uk/maes_mawrs.html.

The above reference also mentions that Mona marble was used in the refurbishment of Hafod, the residence of Thomas Johnes at Cwmystwyth after it had been destroyed by fire in 1807. Sadly, the house no longer exists. Research of old newspapers has revealed the locations of three further occurrences of the use of Mona marble. An article on the consecration of the new chancel of St Barnabas' church Peasemore, Berkshire (Reading Mercury, Oxford Gazette, Newbury Herald, and Berks County Paper dated December 30, 1865, p2) notes that 'A handsome pulpit formed of six columns of green Egyptian and purple Welsh marble has also been presented'. Peter Wright, the church warden of Peasemore church has kindly provided photographs some of the columns (Fig. 1). An article about refurbishment of the Chapel of

Worcester College, Oxford (The Oxford and City Herald dated October 20, 1866, p8) records that 'The Chapel of this college has been much enriched by additional decorations, slabs of Sicilian marble have been laid in the vestibule floor, with "Rouge Royal" and black squares in sections, and Genoa, green, and Welsh marble in the borders.' The assistant chaplain kindly took photographs, and these were forwarded to me by the college Librarian Mark Bainbridge who informed me that the Chapel was refurbished by William Burges in the 1860s (Fig. 2). Further research in the College archives, which were not accessible during this research due to Covid restrictions, may furnish further information on this story. An article on the dedication of a new pulpit in St John the Baptist church Weston super Mare (The Western Daily Press, Bristol dated November 2, 1904, p3) records

that ‘On plan it is circular at the base, breaking off into an octagon above the supporting cluster of 10 circular and detached columns of polished Welsh marble’. Angela Squire, one of the church wardens has kindly provided a photograph of some of the columns (Fig. 3). More recently, a clock worked from Mona marble was auctioned (see https://www.qualityantiqueclocks.com/

portfolio-items/31903-vulliamy-no-647/), and a vase sold recently (Large 18th Century Greek Neoclassical Mona Marble Vase - archive Neoclassical Antiques UK (craigcarrington.com).

References

Greenly, E. 1920. 1:50,000 (& 1 inch to the mile) Geological Map of Anglesey. Geological Survey, G.B., Special Sheet, no. 92 & 93 with parts of 94, 105 & 106.

Horak, J.M. 2002. Mona Marble: Charactericzation and Usage. *Stone in Wales, Materials, Heritage and Conservation.* Cadw, p2-5. (available at https://www.researchgate.net/publication/255179836_Mona_Marble_Characterisation_and_Usage/link/56d9873808aee1aa5f8286fd/download

Ron Austin donation: Tradespersons box of marbles

Andrew Haycock

In 2018, Ron Austin very kindly donated specimens of building and ornamental stones from his personal collection to the Amgueddfa Cymru - National Museum Wales (AC NMW) now accessioned as collection NMW 2018.28G. Included within this are trade samples of stone from around the World, as well as fantastically decorative works of *pietra dura*, that include depictions of a butterfly and several flower mosaics composed of different decorative stones, all inlaid in Belgian Black marble. Some of these wonderfully artistic pieces are though to be Otalian and originate from the be 19thC.

Another welcome addition to the AC collection is a simple-looking, wooden, tradespersons box comprising 29 cut and prepared samples of ornamental stone (Fig.1).

Fig. 1: Trade box (NMW 2018.28G.)with ornamental samples, left to right: (top) – Tinos, Greece; Verde Antico, Italy; Rouge du Languedoc, France. (bottom row) – Portor, Italy; Sicilian, Carrara, Italy.

The top of the box is inscribed ‘J Whitehead and Sons Ltd. Imperial Works, Kennington Oval, London S.E. 11’ (*On Google Streetview, the ‘Imperial’ of ‘Imperial Works’ is still visible at 64 Kennington Road, Oval today).

According to a web reference (1), the company were ‘A multi-generational firm of funerary sculptors, undertakers and marble merchants based in London and with branches in Aberdeen, Carrara and possibly Manchester’, active from 1880 to 1985. Their numerous works include the Titanic Engineers Memorial (1914) in Southampton (2), and the World War I memorial for Worthing (3). This box would have likely have been used by the company to showcase the samples available at the time to customers for decorative stonework. It is unclear when this box was put together and used.

The 29 polished ornamental stones are prepared to approx. 4” x 3” (10 x 7.5 x 0.5 cm) size. They were given to Ron by Mr Lionel Richard ‘Dick’ Sparrow. According to Ron, Dick Sparrow had ‘a role as a chartered engineer for developments overseas, possibly working on airport

NMW Number	Petrological Name	Trade Name	Locality
2018.28G.R.23	marble	Piastraccia	Italy ; Toscana ; Lucca ; Pietrasanta ; Pietrasanta quarries
2018.28G.R.24	calcite var. travertine		Unrecorded
2018.28G.R.25	marble	Arabescato	Italy ; Toscana ; Lucca ; Seravezza
2018.28G.R.26	marble	Pentelikon Marble	Greece ; Athens ; Mount Pentelikon
2018.28G.R.27	limestone, shelly	Bainco del Mare	Croatia ; Istrian Peninsula
2018.28G.R.28	limestone, brecciated	Portor	Italy ; Spezia ; Porto Venere ; Porto Venere quarries
2018.28G.R.29	limestone, brecciated	Lido	Africa ; Morocco
2018.28G.R.30	marble	Borba	Portugal ; Alto Alentejo ; Evora ; Borba quarries
2018.28G.R.31	ophicalcite	Tinos (not specific)	Greece ; Kikládhes Islands ; Tinos Island
2018.28G.R.32	limestone	Yellow Siena	Italy ; Toscana ; Siena ; Montarenti ; Montarenti quarries
2018.28G.R.33	breccia	Breccia Aurora	Italy ; Lombardia ; Paitone
2018.28G.R.34	limestone	Bleu Belge	Belgium ; Namur (Province of) ; Namur ; Bioulix
2018.28G.R.35	limestone	Rouge du Languedoc	France ; Languedoc-Roussillon ; Aude ; Caunes ; Caunes marble quarries
2018.28G.R.36	calcite var. travertine		Unrecorded
2018.28G.R.37	limestone, shelly	Repen Zola	Italy ; Friuli-Venezia-Giulia ; Trieste ; Repen ; Repen quarries
2018.28G.R.38	limestone, gastropod	Purbeck Marble	England ; Dorset ; Swanage
2018.28G.R.39	marble	White Statuary (Second)	Italy ; Toscana ; Massa Carrara ; Carrara
2018.28G.R.40	breccia, serpentine	Verde Antico	Greece ; Thessalía ; Larisa ; Verde antico quarries
2018.28G.R.41	calcite var. travertine	Travertine Mera	Asia ; Turkey ; Denizli ; Kocabas Region
2018.28G.R.42	limestone, nodular	Red Verona	Italy ; Veneto ; Verona ; Dolcè
2018.28G.R.43	limestone, bioclastic	Roman Stone	Italy
2018.28G.R.44	limestone, foraminiferal	Botticino [non specific]	Italy ; Lombardia ; Brescia ; Botticino
2018.28G.R.45	limestone	Trani Marble	Italy ; Puglia ; Trani
2018.28G.R.46	marble	Sicilian (not specific)	Italy ; Toscana ; Massa Carrara ; Carrara
2018.28G.R.47	ophicalcite	Ringborg Green	Sweden ; Norrkoping ; Marmorbrucket
2018.28G.R.48	limestone	Swedish Red Limestone	Sweden ; Öland
2018.28G.R.49	marble	Brèche Rose	Norway ; Nordland ; Fauski ; Norwegian Rose quarries
2018.28G.R.50	limestone, brecciated	Napoléon	France ; Nord - Pas-de-Calais ; Pas-de-Calais ; Hydrequent
2018.28G.R.51	marble	Naxos Marble	Greece ; Naxos ; Kinidaros

Fig. 2: Trade labels on reverse of polished specimens: Bleu Belge Belgium and Swedish Green (Ringborg Green), Sweden.

design'. He was also a member of the Probus Club of Mumbles, Swansea.

On the reverse of each trade samples is a 'trade name'. Each sample in the box has been allocated an individual registration number and documented on the Museum database. The country and location of quarrying has been recorded, where possible, based on research of the trade name and characteristics of the stone.

Specimens within the building stone collection are usually stored together in drawers based on their country of origin. In the case of this trade box, even though the samples range from across Europe, Turkey and Morocco, the samples are kept together within the original box as it would be a shame to split the collection. This box of trade samples will make a valuable resource for research, stone matching, and teaching students about historical building stones, and also make a wonderful display piece in any future exhibition about worked and ornamental stone.
Our thanks went to Ron for such a generous donation.
The full list of stone samples is included above.

Web references:

(1) https://sculpture.gla.ac.uk/view/organization.php?id=msib1_1242690832 'J. Whitehead and Sons Ltd.', Mapping the Practice and Profession of Sculpture in Britain and Ireland 1851-1951, University of Glasgow History of Art and HATII, online database 2011 [http://sculpture.gla.ac.uk/view/organization.php?id=msib1_1242690832, accessed 19 Oct 2021]

(2) https://www.dailyecho.co.uk/heritage/8353018.memorial-for-brave-titanic-engineers-to-be-restored/

(3)http://www.speel.me.uk/chlondon/kenningtonstmarks.htm

Variaties of Pwntan Stone

John Davies

The various sandstones which occur in southern Ceredigion, north Pembrokeshire and north-western Carmarthenshire, have been grouped together using the general term Pwntan Stone, but in reality they consist of a number of sandstones varying in age from Upper Middle Ordovician to Lower Silurian in the following stratigraphical sequence:

Age	Stratigraphic Unit
Silurian	Mynydd Bach Formation
	Claerwen Group
	Allt Goch Formation
	Cwmere Formation
Ordovician	Yr Allt Formation
	Nantmel Mudstone Formation
	Cwm yr Eglwys Mudstone Formation

The geological and topographic maps have been examined to attempt to identify quarries where the stone has been extracted. A 'dip arrow' on a geological map indicates that there is rock exposure which the geologists examined. These sites are compared to where there is evidence on the OS map of quarrying.

Yr Allt Formation

A number of sandstone bodies are found within the Yr Allt Formation, which become more frequently in the upper parts. They include:

- A small unit at Waunmeidy (SN 318501), has been quarried in the small roadside quarry (fig.1).
- A thick band of sandstone is present at Brynhelyg (SN 36046 to SN 369463). A dip arrow is shown at the west end of this and the 1:25,000 OS map shows a quarry present (Fig.2).
- As sandstone present at SN 501480. Marked at the crossroads at SN 502479 no sign of any quarry.
- A band of sandstone marked on Geological Survey map at SN 480450, is indicated on the 1:25000 topographical map as likely to have been a quarry.
- At Gorsgoch a band of sandstone lies in the upper part of the Yr Allt Formation and extends from the hill at SN 470501 to a fault at SN 485508. It was quarried in the roadside quarry at SN 478505. The sandstone forms a fault-bounded block in the centre of Gorsgoch where it was quarried at SN 485505.It is possible that the faulted block extensively quarried in the now worked-out, Allt Goch quarries, SN 490481 and SN 492484, belongs to this same horizon.

The Sandstones at Bwlch-y-fadfa lie stratigraphically between the Yr Allt Formation, and the overlying Cwmere Formation. The outcrop extends from SN 419481 north of Gwarllwyneidos to SN 450499 north of Nant y gwyddau. This outcrop includes the working quarry at Gwarallty faendrex, Bwlch y fada (Chwarel Gwaithio and Cartef Iwan,SN 438491).

Fig. 1. Small abandoned quarry, Waunmeidy.

Fig. 2. Overgrown quarry at Brynhelyg

Fig. 3. (above) Dipping strata in quarry at Gwaithio (SN 438491)

Fig 4. (below) close up of stone from Gwaithio.

Fig.5. Bedding is sandstone, Gwaithio.

Nantmel Mudstone Formation

On the Abergwaun and Aberteifi geological map Sheets, the British Geological Survey have included a considerable thickness of turbidite sandstones and mudstones in the lower part of the Nantmel Mudstone Formation. These occur in two main areas.

- The northern area extends from the mouth of the river Teifi to SN 222486, east of Penparc.Although there are dip arrows marked on the BGS map, indicating there is exposure here, there are no quarries corresponding to them shown on the 1:25,000 topographical map. This suggests that the exposures are most probably natural. In the eastern area around Penparc, there is a single dip arrow.
- The second area, where this unit is exposed, is near Trellyfein (SN 087417) to south-west of Brideil (SN 173413). In the whole of the marked outcrop, there are only two dip arrows and these look like natural outcrops.

A number of sandstone horizons are also marked on the BGS map higher in the Nantmel Mudstone Formation. The outcrops at the Pwntan Sandstone quarries, however, are not indicated as including sandstones, although dip arrows are shown at SN 291493 and SN 292496. The topographic map shows quarries at SN 291493, SN 291494 and SN 291496.

Exposures noted

- Near the top of the Nantmel Mudstone Formation at Plas y berllan (SN 277501), although a dip arow is marked, there is no indication of a quarry on the 1:25,000 map.
- A folded band of sandstone at Rhydlewis from SN 349476 to SN 356472, at the same stratigraphical position as above, near the top of the Nantmel Mudstone Formation. At SN 356472 a quarry is present, and may be the source of building stone for the village.
- A much more continuous, but folded band of sandstones, possibly at the same horizon near the top of the Nantmel Mudstone Formation, is found between SN 321458 (south of Troedyraur) and SN 330420.
- A dip arrow is shown at SN 329450, SN 322441 and SN 335433 (where a quarry is shown on the 1:25,000 OS map) and at SN 333423.

Cwmere Formation

The Allt Goch Sandstone Formation lies stratigraphically between the Cwmere Formation and the Claerwen Group at the base of the latter. The sandstones occurs in several areas, the westernmost being the band which extends from Ynys Lochdyn to Plwmp.

Alltgoch Quarries Ceredigion	
Foel y Bryn, SW quarry Allt Goch	SN 489481
Chwarel Gilwm	SN 490483
Gilwern chwarel, Cwrt Newydd	SN 490483
Chwarel Alltgovh, Cwrt Henri	SN 489481
Allt coch, Cwrt Newydd	SN 489482

- The sandstones are well displayed in the cliffs of Ynys Lochdyn near Llangranog and from the hill of the Iron-age Hillfort Dinas Lochdyn. They continue from the cliff sections east of the hillfort, through a number of folds to the village of Plwmp. They are exposed in the small roadside quarry by the Rectory in the village of Llangranog (SN 317 840), possibly the source of the stone for the church. The sandstones were also quarried at Allt Hoffnant (SN 325522) and there is also an exposure at Tafarncawen (SN 362520). Eastwards at the same horizon in this sequence, the sandstone outcrop stretches from near Cruglas, in a multiple syncline through Capel Cynon almost to Pant Bach (SN 404493). It does not appear to have been quarried in this outcrop.
- Another band of sandstone stretches from Dol Walter at Aberclettwr (SN 447403 to SN 460417), north of Waunifor. There are two quarries marked on the 1:25000 map in this unit, at Fronfelen (SN 455411) and at Allt-y-gog (SN 459415). At about the same horizon, and possibly a continuation of it, is the sandstone at SN 475434, and the quarry at Brynteg (SN 486440). The latter, may have been the source of the stone for the small mansion house at Bwlchbychan SN 476432.

It is most likely that the use of the Ordovician – Silurian sandstones in buildings was very local to outcrops of the lithology suitable for dressing. The turbidite-sandstones of the area were not suitable for dressings, but amongst the sequence a number of more massive sandstone bodies occur, which have a suitable cement which allows them to be dressed. These are extremely limited however, with only two obvious ones; the Pwntan Sandstone itself, and the miss-named Allt Goch Formation sandstone Bwlchyfadfa. This sandstone is older than the Allt Goch Formation on the BGS map.

New light on the source of the dressings from Abbey of Cwm Hir, Radnorshire

John Davies

Abbey Cwm Hir is a 13th Century Cistercian Abbey in the old county of Radnorshire (Mid Powys). The first community of monks was certainly there by 1167, but the built evidence of the community dates from the first third of the 13th century, when the great church was built, which replaced the original structure. This church was, at the time of its construction, one of the largest in the whole of Britain. Because there is no suitable freestone in mid Wales, all the stone for dressings; pillars, windows and door-jambes, had to be imported. The best ? nearest ?available stone for the purpose crops out as a series of low hills in the Shropshire-Cheschire Basin and it is in that area that the search for its source of material has concentrated over the last hundred and sixty years.

The discussion concerning the source of the dressed stone at Abbey Cwm Hir in Radnorshire commenced when Welsh Stone Forum members realised that there was a mis-match between the petrology of the abbey dressed stone and the type lithology of Grinshill Stone in Shropshire, to which it had been assigned by many previous workers. Consultation with the British Geological Survey published definition of the type Tarporley Sandstone Formation, has provided strong evidence that it is to that formation that the Abbey Cwm Hir stone should now be assigned, and also that it is still possible to locate the original sorce in the old quarry workings on Grinshill itself.

Definition of the characteristics of the dressed stones of Abbey Cwm Hir are:-

- The stone used in Abbey Cwm Hir for the pillars, columns, windows and door-jambs is defined as an arkosic sandstone; contianing crystals of quartz, felspar and mica.
- The colour varies from cream to yellowish and sometimes putty-colour to pinkish, and may be slightly reddish.
- From the end of the 19th century, the stone was equated with the Grinshill Sandstone (now known as Helsby Sandstone) of Shropshire and Cheshire basin. This is probably very much because of the colour range.
- It is generaly found in buildings as blocks up to 40 cm thick.
- The sandstone beds can vary from massive, uniform in the lower part to more flaggy in the upper part.
- The sandstone beds frequently show evidence of being deposited by strong water currents, producing lamella, or cross-bedding.
- Quite commonly, the beds of sandstone in their lower parts include cavities up to 3-4cm x 1-2cm, which contain or once contained creamy-grey, or sometimes red, clay.
- These sandstones more rarely show evidence of soft-sediment deformation; that is of the layers become buckled and contorted, produced by instability whilst they were still unconsolidated.

In order to identify the source of the sandstone it was necessary to identify outcrops of rock bearing all of these characteristics. Whilst it is possible to recognise a number of rock units which show some of them, there are fewer, which display all of them. In adition, some of the contenders for a match, include characteristics which are not found in the abbey stone.

Fig. 1. Thin bedded sandstone dressing. Abbey Cwm Hir

Grinshill

Grinshill is an escarpment 10 km (*c*. 7 miles) north of Shrewsbury, which extends for 3 km, from Brockhurst on the A49, in the east, to the village of Clive, in the west. It is an area of extensive historical quarrying for its very fine range of building stone. There is a history of quarrying here since Elizabethan times and this has been documented in a series of publications by the Clive & Grhinshill Conservation Group (e.g. Thompson, 2006). Howerver, to our present knowledge, they have not yet published a volume on the use of the stone from the Mediaeval period, though reference is made to the use of stone from *c*. 1000 AD in the Geological Conservation Review Permo-Triassic volume (Benton *et al.,* 2002*)* .

The stone from the quarried area is divided into the following stratigraphical sequences, this nomenclature has changed from the units initially attributed by Pockock (1925).

Current Stratigraphic terminology		Previous names, thickness
Mercian Mudstone Group (MMG)	Tarporley Siltstone Formation	Waterstones • Grinshill Flagstone c.6m • Esk Bed c. 0.5m yellow-grey sand
Sherwood Sandstone Group (SSG)	Helsby Sandstone Formation (HSF)	Grinshill white sandstone c. 30m
	Wilmslow Sandstone Formation (WSF)	Red Grinshill Stone

The Wilmslow Sandstone Formation includes bright red, dune-bedded sandstones (Red Grinshill Stone), which were quarried from the lower part of the sequence at Grindhill, next to the village of that name. These were

used in the area, and across the border into large areas of Montgomeryshire for churches and other buildings.

The Grinshill Sandstone (Grinshill Stone), now known by the name Helsby Sandstone Formation, is the white-cream-yellow sandstone previously suggested as the source material for Abbey Cwm Hir. It matches the colour range and degree of compaction as the Abbey Cwm Hir dressed stone. However, it does not contain the key ingredient, of mica, which is found profusely in the stone at Abbey Cwm Hir, Chirbury Priory (Shropshire) and at Strata Marcella Abbey (Montgomeryshire). It, like the Wilmslow Sandstone Formation (Red Grinshill) is dune-bedded, which indicates that it was deposited in aeolianconditions – forming wind-blown sand-dunes. Under these conditions, mica does not survive transportation, and as a result, neither of these two varieties of Grinshill stone contain any mica at all. From the latter half of the 19th century, those who have described the building stone of Abbey Cwm Hir, such as Williams (1890,1896) and Ralegh-Radford (1982), and including myself, (Davies, 2002) have consistently described the stone there as Grinshill Stone (Helsby Sandstone Formation). It was not until members of the Welsh Stone Forum (Horak *et al.* pers. com.) examined its petrology in detail, that it was realised that the Abbey Cwm Hir dressings were unlikley to be Grinshill Stone (HSF).

There are other characteristics of Grinshill Stone (HSF) that are not seen in the masonary at the abbey. Firstly, much of the early quarried stone was derived from the western end of the escarpment around the village of Clive. This sandstone is greyer in colour and contains quartz-veins and barytes nodules. This is a destinctive texture, and many of the churches in Montgomeryshire from the 12th century onwards, used this stone for dressings. This is very different to the stone at Abbey Cwm Hir, Chirbury Priory and Strata Marcella Abbey, so much so, that I refrred to it as Old Grinshill (Davies, 2013), to designate its use in that county. Its characteristics indicate that it is what Pocock (1925) termed the Esk Bed, basal

Fig. X Esk Bed exposed in the road cutting at Clive Church, showing bartye nodules and quartz veins

Fig X. A block of the Esk Bed with barytes nodules.

to the Tarporley Siltastone Formation. Although the later Grinshill Stone (HSF) also has veins, they are thin, less abundant and frequently, straight, and again consist of quartz crystals. There are no barytes nodules in these sandstones. This Grinshill Stone was used extensively throughout the 19th century and is still being quarried for dressed stone from the Grinshill Stone Quarries. The last major property which distinguishes Grinshill Stone from that at Abbey Cwm Hir, is the bed thickness. The stone at the Abbey, suggests that the sandstone beds from which it was extracted were unlikely to be more than 40cm thick, but the Grinshill sandstones from Grinshill are several metres thick.

This realisation of the mis-match of lithologies and bed-structure, led to an investigation of other sandstones which could be considered candidates for the Abbey dressed stone. There are micaceous sandstones in the upper part of the Silurian – Old Red Sandstone sequence of Breconshire and the Borderland. However, these are more greenish-red and greanish-cream (cf. Downton Castle Sandstone and Conigar Pit Formation). These are much older, and have undergone much more compaction and diagenetic alteration, than that observed in the sandstone at Abbey Cwm Hir. Although flags from the 'Tilestones' part of this sequance, were used for roofing stones at Abbey Cwm Hir and Strata Florida, the sandstones are sufficiently distinctive not to be confused with the Abbey stone. Most of the Upper Silurian and Devonian sandstones show similar characteristics.

This leaves the upper sequence from Grinshill, which was previously referred to as 'Waterstones' and is now defined by the British Geological Survey as the Tarporley Sandstone Formation, above the Esk Bed. It occurs in the top 3m of the current Grinshill Stone Quarry faces, but in other parts of the outcrop is up to 6m thick. Although it occurs extensively around the Midlands of England, it is defined by its outcrop at Tarporley in Cheshire. The British Geological Survey definition of this type sequence includes all the characteristics identified in

Fig.X. sandstone sequence at Grinshill.

the dressed stone from Abbey Cwm Hir; bed thickness, sedimentary structures, including weathered-out cream-grey, clay clasts, and profuse mica fakes. It was deposed under intertidal, marine conditions. Water, as a means of transportation and deposition, was not so destructive to the fragile mica-flakes, and these have been described by BGS as characteristic of the sandstones interbedded with the siltstones of this formation. These characteristics have also been described in the Geological Conservation Review pf the Permo-Triassic (Benton *et al.,* 2002) as being present in the sandstones of the Tarporley Sitstone Formation (TSF) at Grinshill.

One question is still outstanding, the fact that no quartz veins have been observed in the dressed stone at Abbey Cwm Hir, or in the abbey stone re-use around the area, although they can be seen in stone suggested to have come from Strata Marcella Abbey. BGS does not record such veins in the type TSF sandstone, but they may occur in the Grinshill outcrop. The bed thickness of sandstones within the Tarporley Siltstone Formation sandstones observable at the surviving Grinshill workings is consistent with the aprox 35-40cm seen block sizes in the Abbey.

Possible explanation.

It is likely that many of the thicker sandstone beds from the Tarporley Siltstone Formation at Grinshill, were worked out from the early quarries, in later medieval times, before the later quarries cut down into the underlying Grinshill Sandstone (HSF). The change of environment, from wind transport to water transport, during the Trias, when these rocks were formed, may well have been the result of changes to the physical geography of the area as it was invaded by the sea.

Two further considerations, that support Grinshill as the source of the Abbey Cwm Hir are, firstly, that there are no direct transport links from other outcrops of the Tarporly Sandstone to the Abbey, along which large quantities of building stone could be easily transported there, but from Grinshill itself. The Roman road system leads to Shrewsbury, and thence over Long Mountain to Chirbury and Forden, then the route runs through Ceri (Kerry) and the ridgeway to Dolfor and David's Well to the Abbey. The second piece of evidence, is that in the churchyard of Chirbury priory church, exactly on the route, is a stone pillar worked from the same lithology as the Abbey Cwm Hir, and showing the same architectural features as those at the abbey, enabling it to be dated to the same period of construction.

It is therefore here suggested that Grinshill is indeed the source of the dressed stone of Abbey Cwm Hir and that it cannot be Grinshill Stone, but is almost without doubt sandstone from the Tarporley Siltstone Formation(see BGS definition of the type Tarporley Siltstone Formation), from quarries in the old hilltop of Grinshill, since worked through into the underlying Grinshill Stone.

Remaining work is required by collection of material from the the type Tarporley outcrops and possibly from Grinshill, and microscopically comparing them with the material which is in the possession of the National Museum of Wales to confirm or negate the descriptions which exist.

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British and Welsh Marble Quarries Limited

Mike Statham

Introduction

In May 1910 the British and Welsh Marble Quarries Limited (BWMQL) was registered with a capital of £40,000 in 39,000 Preference Shares of £1 each and 20,000 Ordinary Shares of 1s each 'to carry on the business of marble and stone quarriers and merchants, etc and to adopt an agreement with E J Evans for the acquisition of the marble and stone quarries and metals, metallic minerals and ores, under lands known as Mynyddmawr [sic], Aberdaron, Carnarvon.' Subscribers were E J Evans, Dolguan, Aberystwyth, metallurgist; E Lewis Preswylfa, Trinity Road, Aberystwyth, accountant; E E Owen, Paris House, Aberystwyth, outfitter; A D Williams, A M I M E 45 Bridge Street, Aberystwyth, monumental sculptor; I Rees Graigwen, Bridge Street, Aberystwyth, incorporated accountant; B Hicks Cambrian Chambers, Aberystwyth, quarry owner; J Meyrick, 1 Bryn Serth, Sirhowy Mon, colliery official; T Thomas 2 Bryn Serth Sirhowy Mon. J Meyrick was the managing director T Thomas and E J Evans was to join the board after allotment. Salaries were to be £250 pa for Meyrick and Evans and £100 pa for others[1].

The Home Office's annual List of Quarries[2] for 1913 shows BWMQL occasionally worked limestone at Mynydd Mawr under the management of E J Evans c/o Tynewydd Hotel, Aberdaron. Also, in 1913 a quarry at Porth Orion, about 3km north of Mynydd Mawr,
shown as owned by E J Evans also worked limestone with four men outdoors and four indoors. In 1914 Porth Orion was worked with the same workforce set-up but only occasionally and Mynydd Mawr was worked occasionally with two men outdoors and two indoors.

The National Archives holds copies of mineral leases from the Crown Estates held by the BWMQL at Mynydd Mawr and Mynydd Angelog [sic], about 1.5kn north of Mynydd Mawr, dated between 1 Jan 1906 and 31 Dec 1916, and a Board of Trade file which indicates the company was dissolved in 1949, neither of which have yet been consulted[3]. The National Museum of Wales holds a share certificate for the Company[4]. An application form for shares with an abridged prospectus also appeared in November 1910[5]. However, it is interesting to note that at various dates between 7 May 1913 and 7 January 1914 *Truth, John Bull* and *Reynold's Newspaper* all issued warnings not to invest in the company. On 1 July 1914 Evans offered free stone for a competition for the Pwllheli Chair Eisteddfod of a bust carved in marble of the Right Hon D Lloyd George[6]. On 20 March 1915 *John Bull* published an article headed 'Not playing at marbles', which stated that the guarantee by the Managing Director of payment of 10% interest for three years on shares had not been forthcoming. It also printed the text of an illiterate letter received by the paper from Mr E J Evans and D B A Evans which ended; '….The war as [sic] made a lot of difficulty to the Company'.

Although at the time of registration Evans had given his occupation as metallurgist, in the 1911 census his stated occupations were Chemist and Mine Owner. At that time, he had a chemist's shop in Aberystwyth and owned Pompren barytes mine at Porth Simdde, Aberdaron. In 1928, by which time he had moved to Glyncorrwg in Glamorganshire where he had opened another chemist's shop, he offered to supply stones for memorials to musicians Eos Rhondda [alias Thomas Davies] and Llinos Rhondda [alias Madame Nellie Rees] 'from a marble quarry I am interested in North Wales'[7].

Geology

The area of interest lies within the outcrop of the Gwna Mélange of late Precambrian age. The mélange comprises a chaotic jumble of clasts of a variety of rock types in a grey-green slaty mudstone and siltstone matrix (Gibbons & McCarroll, 1993). At Mynydd Mawr large clasts of limestone associated with red mudstone and schists were quarried. Figure 3 of BGS Memoir 134 (Aberdaron and Bardsey Island) shows a large-scale geology map of the Mynydd Mawr area (Gibbons & McCaroll, 1993). At Porth Orion, according to the Home Office List of Quarries, limestone was quarried, jasper has also been found in this area and may have been worked.

History

Mynydd Mawr

This area was visited in by the author 2021. Two quarries on Mynydd Mawr marked 'Quarries' on the 1888 1:2,500 OS map (SH137257) indicated that they were active at that time. The 1900 OS map shows a pile of quarry waste, now present at the mouth of the southernmost quarry, indicating the quarry was still active. On the 1918 OS map, surveyed in 1914, the waste pile had increased in size somewhat, again indicating activity was ongoing. As in the previous two editions, the southernmost quarry, the larger of the two, was accessed via a track from the end of a gated road about 70m west of the homestead of Ty Mawr, but by 1914 about half way between the gate and the quarry there was now a roughly square-shaped structure and opposite this on the south side of the track there was a pile of waste, indicating that the structure was probably a workshop for dressing/carving the stone from the quarry. This structure is not shown on OS maps after 1920 and is not present on an aerial photograph of 1945. In addition, two very small quarries close to each other were now also present, one on the north side of the track just west of the gate and one on the northwest side of the track leading to the site of St Mary's church.

Porth Orion

This area has not yet been visited. The 1888 OS map shows a feature marked 'Kiln' with a track leading in its general direction of Porth Orion (SH156285). The feature is marked 'old kiln' on the 1900 OS map. The 1918 OS map surveyed in 1914, shows there was a very small square feature a little further WSW of the location of

the kiln shown in the previous edition, and a new field boundary had been created to the east and the access track was no longer shown. No OS map shows any quarries in this area, though later editions and aerial photographs show additional field boundaries in this locale. The Coflein website (RCAHMW) notes a feature at SH1569028600 to possibly be a quarry which was spotted from an oblique aerial photograph dated 1996[8]. In fact this image appears to show two possible locations in this general area which may be sites of the activity of BWMQL in 1913/14.

Acknowledgements

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Penarth Alabaster

Mike Staham

Two new examples of the use of Penarth alabaster have come to light since publication of the last Newsletter. In St Lythans church in the Vale of Glamorgan there is a wall memorial to Catherine wife of Evan John in which the urn is carved from Penarth alabaster (Fig. 1. - top right)). Whilst the stone used for the inscription is probably an Italian statuary marble, the shelf upon which the urn stands and the oval backing stone have not been identified.

Within the lower ground floor at the far end of Cornerstone, the former Ebenezer chapel in Charles Street, Cardiff, there a large wall memorial to Rev. Lewis Powell (Fig. 2- bottom right). The five circular and two square decorations are Penarth alabaster; see close-up of one (inset Fig. 2). Whilst the main tablet is probably an Italian statuary marble, it is not possible to identify the stone used for the surround as it has been painted over. The dark grey/black stone used for the four columns has not been identified.

Fig.1. Memorial to Catherine John, St Lythans church.

Fig. 2. Rev. Lewis Powell memorial, Ebernezer chapel, with inset image of alabaster detail.

Fieldtrip Report

Wiston & Llawhaden
22nd October 2022

Robin Sheldrake

The field meeting was called to examine building stone in the area to the North-east of Haverfordwest, in particular Cethings Sandstone, the use of which is almost undocumented. Participants met in the car park outside Wiston Church (SN 023 180), where a large buff-coloured block containing both conglomerate and of sandstone present on the grass verge, provided an excellent example of what we were to see in different contexts during the day.

The village of Wiston is 6 kilometres east of Haverfordwest and sits on a plateau up to 100 m above OD. The bedrock to the plateau is Cethings Sandstone and associated mudstones and this extends as discontinuous outcrop, caused by folding and faulting, eastwards to Llandrew Velfrey, the high ground overlooking the vale of the River Taf at Whitland; a distance of 18 kilometres.

Following this introduction, we moved across the road, to examine the castle. The bank enclosing the 'motte' is of a much earlier Iron Age. It was within this bank that a Flemish Lord by the name of Wizo chose to erect a defensive mound. A testing climb of 49 steps led up to the platform at the top of the mound. A keep of local stone was built on this in the 13th century, to replace what was originally believed to have been a timber structure (Fig.1).

The fabric of the keep was seen to be dominated by grey homogenous sandstone, although there were also areas of masonry composed of prominent, buff conglomerate and pebbly sandstone, closely resembling the stone inspected by the roadside (Fig 2 & 3.). Cocks & Price (1975) described the Cethings Sandstone as either buff or grey coloured sandstone, so the colour variations observed represent variations in the iron content of the rock, or the state of oxidation of the iron. It is noted that on fresh surface sin outcrop the Cethings Sandstone is typically grey. No dressings were observed.

The castle, sits on mudstones, associated with the Cethings Sandstone, although the sandstone is mapped as outcropping to the immediate east and west of the castle, although no rock is exposed. The outcrop pattern is controlled by folding and faulting of the sequence. It may be that the location of the original Iron Age mound (and consequently the castle) in this specific position, may have been influenced by the mudstone outcrops, which would have been easier to excavate than the adjacent sandstone unit.

Wiston developed as a medieval borough, in which burgage plots were laid out at either side of the present east west road. The church would have been one of the first 12th century buildings to serve the community. The

Fig. 1. Ruins of Wiston Castle.

Fig.2. Conglomerate (Basal Conglomerate) assosicated with the Cethings Sandstone. Wiston Castle). Scale bar in cm.

Fig. 3. Grey Cethings Sandstone, Wiston Castle

round-headed arches within the entrance 'support' this suggestion. Few traces of the medieval borough remain. It was suggested that Wiston men were in the army of the Crown defeated by Owen Glyndwr at the battle of Hyddgen in 1405. The site of the manor house to the east of the castle, was the home of the Wogan family in the 17th century Commonwealth. Until the Municipal Reform Act of 1835, Wiston still returned a Member of Parliament to Westminster. In the 19th century, the estate came into

Fig. 4. Quoins of Cethings Sandstone, in St Mary Magdalene, Wiston.

Fig. 5. St Marys Magdelen, Wiston. Fabric of rubble Carbonifersou Limestones and block doorway dressing of buff Cethings Sandstone.

the ownership of Lord Cawdor, under whose patronage restoration works were undertaken to the Church in 1864.

A detailed description of the church is provided by Dyfed Archaeological Trust (*https://St Mary Magdalene, Wiston, Pembrokeshire – Dyfed Archaeological Trust*) which records 5 main phases, from the C13 Nave to 1864 restoration. The construction is of Carboniferous limestone with some Old Red Sandstone.

Inspection of the exterior showed that the 1864 work had entirely replaced some of the window dressings with Bath Stone (identified by the presence of ooliths and calcite veins), although on the south wall, where only partial replaced both Dundry Stone and minor Sutton Stone were identified as the original stones used. We have seen mixtures of these two stones in medieval use. The windows of the south nave in contrast are replaced in grey Forest Pennant sandstone, with no indication of the original stone used in the C13. A blocked doorway, in the south nave, has a surround of sandstone (as opposed to limestone mentioned in the report), interpreted as grey Cethings Sandstone (Fig 4 & .), with a similar interpretation made for the north porch doorway.

Inside the church, Tim palmer rapidly confirmed that the 12th century font was worked from Dundry Stone, although this had been reworked in the 19th century. The chancel arch, recorded as worked from Old Red Sandstone, is a pebbly medium-grained sandstone. We broke for lunch, and took shelter within the church, in the company of Malcolm Lewis. Thanks to Malcolm, we were able to dry off and sit comfortably to eat our packed lunches.

After lunch, we drove 5 km eastwards towards Llawhaden. *En route*, we made a brief roadside stop to examine Cranberry Cottage. The stonework has been exposed recently following removal of the cement sand render. The main fabric of this is an excellent example of use of Cethings Stone, with blocks showing both the buff and the grey varieties. Some stones revealed a grey core with a buff margin, reflecting the iron content of the stone and the level of weathering/oxidation of the iron. The stone also showed different levels of grain-size, with fine-grained sandstone, pebble sandstone and conglomerate blocks observed. The quoins of the house are worked from black Ordovician (Llanvirn) limestone of the Llandeilo Limestone Formation, which has distinctive 'gashes' of white calcite. A quarry is known to have worked this lithology nearby at Bullhook (SN 051 205). These quoins are oriented at right angles to the beds in the limestone, and in the return face of some blocks, displayed the surface of the gashes.

The next stop was Llawhaden Castle, which was built in the late 13th century by Bishop Thomas Bek who reportedly found St Davids, too inconveniently far to the west. In support of his new palace, he planned a new medieval community of burgage plots similar to Wiston. His ambitions matched those of King Edward 1st, himself keen on castle building elsewhere in Wales. Similar to Wiston, Llawhaden sits on an outcrop of Cethings Sandstone,

Fig. 6. Llawhaden Castle gatehouse worked from squarred Cethings Sandstone blocks, with a fieze of black ? Carboniferous Limestone.

Fig. 7. South range of the castle, Cethinbgs Sandstone blocks and dressings, with the excpetion of the second storey window, where there is a lintel of purple/red Caerbwdy Sandstone.

which extends eastwards to the Easter Cleddau. The sandstone unit, which also include conglomerate horizons (which are exposed on the north side of the moat) lies within a mudstone sequence, and although the outcrop is narrow here, further outcrops occur to the north around Broadway, and on the east bank of the Easter Cleddau.

The fabric of the castle is constructed from coursed blocks of yellow and grey Cethings Sandstone and conglomerate. These are initially seen as buff block in the late 14th C gatehouse, associated with a frieze of grey Carboniferous Limestone on both towers and above the archway (Fig. 6). This stone has been used throughout the site, including for window and doorway dressing, where preserved (Fig. 7). The only exception is in the south range where several windows on the east façade and a tower window on the west façade, have dressings of purplish sandstone. Although not inspected close up this is considered to be Caerbwdy Sandstone (Cambrian age), from the St David's area (Fig. 8.. The close connection between Llawhaden and St David's, would support this conclusion.

Beside the lane on the way to the castle, we stopped to examine a small two storey outbuilding with 'flat' arches of Cethings Sandstone, accurately cut into wedge-shapes either side of a central keystone. The owner reported that the building had been the workshop of the village cooper in bygone times.

Llawhaden Church was the final stop of the day. A detailed description of the building is provided by Dyfed Archaeological Trust (*http://St Aidan, Llawhaden, Pembrokeshire – Dyfed Archaeological Trust (dyfedarchaeology.org.uk*). It is dedicated to St. Aidan and stands on the west bank of the Eastern Cleddau, at 12 metres above sea level. St Aidans church although founded in the 12th century, was rebuilt in 13th and 14th centuries, with repairs in 1932 and renovation work in 1861-2. The dedication is after a 6th century monk and there is a 6th century inscribed cross in the face of the east wall.

Fig. 8. Close up of Cethings Sandstone doorway dressing in Fig.7.

The fabric of the church is recorded as being built from limestone, or squared limestone rubble, (including the porch, which was rebuilt in 1860sBath Stone appears to have been used for both 16th century and replacement 19th century window dressings. A large block of conglomeratic Cethings Sandstone was noted at the base of the east side of the tower.

It was fortunate that the Church was open at the time of our visit, and the volunteer cleaner kindly admitted us to the interior, subject to cautionary remarks about muddy boots! Investigation of the inside of the church revealed the abacus (top stone of the pillar) of the chancel arcade with an attractive cable moulding, is worked from conglomeratic associated with the Cethings Sandstone. This was the only conglomerate noted on the interior of the church. An animal head corbel above the pillar was also examined, and although listed as of oolite (DAT report), was on closer examination found to be of Dundry Stone. The DAT report also notes a weathered effigy worked from Nolton Stone, but this was not verified. The font, which showed evidence of having been retooled, was also identified as Dundry Stone.

Llawhaden Mill which lies to the south of the church is a building is three storeys in height, built at right angles to the west bank of the river. The front entrance to the mill is an elliptical arch framed within finely worked Cethings Sandstone masonry, similar to that observed in the Cooper's building by the castle. The keystone bears the date 1765. The millstream passes under the building which was powered by an undershot wheel housed inside the building.

We made our farewells in the car park by the church, and went our separate ways, the majority facing a long journey back to the east.

Geology and description of Cethings Sandstone & associated conglomerate

Jana Horak

The Cethings Sandstone is formally referred to as the Cethings Sandstone Member of the Portfield Formations (Cox & Price, 1975), this formation also includes conglomerate. In the older literature the conglomerate was termed the Basal Conglomerate and along with the Cethings sandstone (and some mudstone) was referred to as the Basement Beds. The 'type' locality is described by Cox & Price (1975) from Cethings (SN 966 16), to the NE of Haverfordwest where it is 8.5m thick. This unit is recorded as persisting as far as Narberth and Llandewi Velfrey with the conglomerate developing to the east of Haverford west and particularly arounds Robeston Wathern (Cox & Prices 1975). The Cethings Sandstone is of variable thickness, but is a more persistent units than the conglomerate, which may or may not be present below the sandstone. Strahan *et al,* 1914 Originally assigned the sandstone and conglomerate to the lowest most Silurian strata, but these are now included within the uppermost Ordovician, Hirnantian Stage.

In hand specimen the buff sandstone, is fine to medium, relatively homogeneous, except where pebbly, and contains visible grains of quartz and mica. It may show fine-scale cross bedding and some colour variation. Some samples, such as that seen in Cranberry Cottage, show a grey core and a buff outer layer, other samples are buff throughout.

The conglomerate may have a high density of clasts, with both rounded pebbles of quartz, and igneous rocks (plutonic and volcanics), in addition to angular clasts of reworked sediment. Within the areas the conglomerate is recorded as being up to seven meter thick. Further work is on going to characterize the thin section petrology of the Portfield Formation sandstone and conglomerate.

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An Interesting Font

Within St Lythans church there is an interesting font decorated with unusual carved "chevrons"; see Figure. The stone has been confidently identified by Chris Lee as Sutton Stone.

Mike

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