Fforwm Cerrig Cymru Welsh Stone Forum

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Welcome to Newsletter 17. Many thanks to everyone who has contributed to this edition, to the leaders of the 2019 programme, and those involved in preparing the 2020 programme (*see important note below).

As you will see this is a slightly shorter Newsletter compared to other years. We would encourage anyone who has news, or short articles, on the use of stone or stone conservation projects to make contact with us. If required, assistance can be provided with preparing an article.

Finally, since preparing the 2020 programme the worsening Covid-19 epidemic has led us to suspend the programme until further notice. We will notify you once it recommences and when it does there are likely to be changes to the details so it is essential that you contact Mike Statham (stathammichael@hotmail.com) if you intend coming to one of the trips.

Steve Howe,
Newsletter Editor

PROGRAMME 2019

2020 AGM & Anual Lecture,
Postponed. Future date tbc

The 2020 AGM will be held on Saturday 23rd April at St Fagan's, National Museum of History, Cardiff. Coffee from 10.30, with proceedings starting at 11.00. Note change of venue from the Oakdale Working Men's Institute to the main building. Abundant parking, payment via ticket machine in the car park. Any items for the AGM agenda should be sent to the Chairman, Dr John Davies (sion_cwm_hir@hotmail.com).

The Annual Lecture will follow at 11.45. Dr Ruth Sidall, co-leader of last Sepetember's field meeting, will talk on *Well-travelled rubble: The diverse building materials of Medieval Churches in East Anglia*. Lunch will be taken in the Museum and this will be followed by a peramulation round the site to inspect the buildings and the stone used.

Non-members are welcome to attend the lecture. In view of the possibility dispuption from the Covid-19 outbreak, please inform the Secretary if you wish to attend (jana.horak@museumwales.ac.uk). You will be contacted if there is any change of plan.

Field Meetings
Suspended until further notice

May 16th: Churches of the Gwent Levels (part 2)
Leader: Jana Horak
Meet: 11.00, St Thomas the Apostle Church, Redwick, Gwent, (Grid Reference ST 41228413) .

We will continue with the survey work we started last year, attempting to map the building stones in this C14th and C15th church. See the Coflein entry for more details of this site (https://coflein.gov.uk). We aim to have lunch at the Rose Inn opposite the church, and continue to a second location (tbc) in the afternoon.

June 13th: Ballast as a building material
Leader: Jana Horak & Mike Statham
Meet: National Museum Cardiff, 11.00.

After a short introduction to ballast, we will examine ballast in buildings around the city centre.

July 11th: Building stones of Llandrindod Wells
Leaders: John Davies
Meet: Further details to be confirmed.

September 12th & 13th: Pembrokeshire
Leader: John Davies & John Shipton
Meet Saturday: in the car park at the Commons, Pembroke. O.S. Ref: SM 985 012.

The itinerary will be St. Petrox (SR 971 976), Lamphey Bishops Palace (SN 019 008), Carew Castle (SN 046 037), Llawhaden (SN 072 175).

Meet Sunday: Johnston Church (SM 932 10), we will then take in Steynton Church (SM 917 078), Herbrandston Church (SM 871 076), St Brides (SM 802 108).

Meet: October 10th (tbc)
At the time of printing this field trip is yet to be confirmed, it may well be the rescheduled May trip.

Subscriptions

If you have not paid your subscription for 2020, please forward payment to Andrew Haycock (andrew.haycock@museumwales.ac.uk). As in previous years, if you are able to do this via a bank transfer then this is very helpful.

A note on ship's ballast

Mike Statham

The use of ships ballast for land reclamation and as a building material is ubiquitous in ports across the world. During Welsh Stone Forum field excursions examples have been noted in Swansea and Newport and the topic has been discussed in several articles in the *Newsletter* (Robinson, 2006, Protheroe-Jones, 2007). Much of the discussion inevitably hinged around 'where material came from and when and how it got where it is'.

It is well known that Cardiff exported coal to practically every corner of the globe and that a fair proportion of ships arriving to take the coal away came 'in ballast'. This often comprised waste materials fit only for landfill. Certainly, in the early days at the Bute West Dock a bank of ballast was created at mean high water mark behind which this material was tipped (*The Cardiff Times*, 21 April 1865). Later, clay pits excavated in land adjacent to the dock were used for disposal of unwanted material. Later still the Bute Dock Company acquired a large area of the foreshore for expansion of the docks, which was raised up with whatever 'inert' material was available, which doubtless included ballast. Notwithstanding this, with Cardiff's rapid expansion stone was always in short supply, which created a ready market for any stone that could be used in construction. This encouraged ships' captains to bring in clean stone where available and in 1853 ballast stone was selling for 1s 2d per ton (*Cardiff and Merthyr Guardian*, 24 Sept 1853).

In Cardiff some of the rough ballast stone, comprising exotic metamorphic and igneous rocks, can be seen in garden walls in many of the Victorian areas of the city. John Perkins (Perkins, 1984) mentions examples in Cathays and Eric Robinson (Robinson, 2006) mentions these and ones in Splott and Roath. To this can be added Riverside and Canton. Recent examination of ballast stone in Pontcanna identified blocks of granite, augen granite gneiss, mylonitic granite, and granite pegmatite in a garden wall in Hamilton Street (Fig.1) and variably vesiculated basaltic lava is also locally abundant in a garden wall in the back lane of Plasturton Gardens (Fig. 2). Although the source of this is not confirmed, Perkins (1984) suggested that similar basaltic lava from Cathays was derived from the Naples region. Protheroe-Jones (2007) mentions ships from the Mediterranean in the C19th frequently being in ballast, which provides a line of evidence to support this suggestion.

Figure 1. (top left). Block of granite, granite mylonite, and garnet- bearing gneiss, Hamilton Street. Figure 2. (bottom left). A block of basaltic lava, wall in back lane, Plasturton Gardens. Figure 3. (top right). Weathered columnar basalt in former chapel Charles Street. Fig. 4. (bottom right). Augen gneiss Galston Street.

A good place to observe the wide range of ballast rock types to be found in the city is in the walls of a former chapel in Charles Street, located directly opposite the Roman Catholic Cathedral. Designed by R. G. Thomas of Newport for the Congregationalists in 1855 (Newman. 1995), it later became the Ebenezer Chapel and is now the Cornerstone Conference, Arts Centre and Community Hub. It is recorded that, apart from the Bath Stone dressings, the walls were *entirely* constructed of ship's ballast (*Monmouthshire Merlin*, 7 July 1855). It was also claimed that it contained stone from every country in the world, which can hardly be true, and it cannot be said for certain that the walls are entirely constructed of ballast. Perkins (1984) identified several varieties of granite, dolerite and schist, which are certainly not found locally, but also noted the presence of quartz conglomerates (from the Millstone Grit), Carboniferous Limestone, Old Red Sandstone and Pennant Sandstone, all of which are found around Cardiff. However, there is a large proportion of exotic materials present. Amongst the huge array of different rock types Figure 3 shows what appears to be a piece of weathered columnar basalt. The hall behind the chapel, built in 1871, also has multicoloured random rubble walling but the walls contain somewhat less exotic material and more rounded elements. Perkins (1984) states that the chapel is the only major building in Cardiff which makes use of ballast, noting that this was 'normally relegated to the friezes and back lanes of housing districts.' However, an interesting example of quantities of various types of ballast stone distributed randomly across the façades of an entire row of houses has recently come to light in Roath.

In 1876 the building firm of Purnell and Fry erected a row of terrace houses in Galston Street, Roath, Cardiff (Glamorgan Archives. BC/5/1/684). There is no architect mentioned in the planning application, so the builder was probably responsible for the design. The front elevations are all constructed in multicoloured random rubble, which contains a variety of volcanic and metamorphic rocks, including granite, gneiss and lava, together with a near equal proportion of rock of local origin, particularly Carboniferous Limestone. One of the exotics, a fine example of an augen gneiss, is shown in Fig. 4. Whether one considers the appearance of the terrace to be aesthetically pleasing is of course a matter of taste, but it certainly makes a change from the ubiquitous Pennant Sandstone or rendered façades common to much of the Victorian parts of Cardiff and was, perhaps, a statement of the firm's aspirations.

A further example of the use of ballast in random rubble walls can be found in nearby Zinc Street, though the proportion of exotic material seems much less than in Galston Street. There is no information about Zinc Street in the Glamorgan Archives but the similarity between the two streets suggests the builder could also be Purnell and Fry.

Postscript

As information was being gathered for this article an interesting and somewhat sobering example of the origin and subsequent fate of ballast came to my attention. Blitzed buildings from Bristol were used as ballast in American supply ships returning to New York in WW2. This material was land-filled in an area between 23rd and 34th Street known as Bristol Basin, to become East River Drive, where a plaque was placed commemorating this fact in 1942. The plaque was rededicated in 1972 by the film star Cary Grant, whose parents lived through the bombing in Bristol. The road is now called Franklin D Roosevelt Drive (http://www.oldsaltblog.com/2014/02/building-new-york-with-ships-ballast-cobblestones-blitz-bricks-bristol-basin/ accessed 28.11.2018). Without the dedicated plaque, who could have guessed that part of the City of Bristol lies buried beneath the streets of New York?

References

Anon, 1865, Ballast Tipping at Cardiff Flats, *The Cardiff Times*. 21 April 1865

Anon, 1853, *Cardiff and Merthyr Guardian*, 24 Sept 1853

Newman, John. 1995, *The Buildings of Wales – Glamorgan.* Penguin, 717pp

Perkins, John W. 1984, *The Building Stones of Cardiff.* University College Cardiff Press 94pp

Protheroe-Jones, R., 2007, Ballast and Beach Pebbles - some observations. *Welsh Stone Forum Newsletter* **4**, 6-8

Robinson, Eric.2006, More about 'ballast'. *Welsh Stone Forum Newsletter* **3**, 8-10

Building stone from Pwllheli

Jana Horak

As noted in the account of September's field meeting (see p 13), many of the buildings in Pwllheli constructed prior to the arrival of the railway in 1867, have a rendered external fabric. Notable exceptions to this are the Old Town Hall (1820) and Capel Tabernacl (1861) in Penlan Street, both of which are built from dolerite (igneous rock).

The Tabernacle is constructed from rock which was extracted from the quarry at Gimblet Rock (Carreg yr Imbill), on the south-east entrance to Pwllheli harbour. It is a coarse dolerite of Ordovician, more specifically Caradocian, age (about 450-458 million years old) (Fig. 1) . Locally, it contains large patches of coarse-grained gabbro pegmatite (up to 1m across) (Fig.2). Darker (more ultramafic, pyroxene-rich) and paler (leucocratic, plagioclase-rich) patches have also been noted (Young *et al*, 2002). These can be variably termed dolerite, gabbro, or gabbro pegmatite, depending on the exact grain size. In thin section the dolerite is seen to be composed of plagioclase, clinopyroxene and slightly porphyritic plagioclase feldspar (crystals larger than the crystals they are embedded in). Olivine may also be present.

The Tabernacl (now Aesthetic Arte), in Penlan Street, has a fabric of random ashlar. Close inspection of the stone

Figure 1. Top left, coarse dolerite, with main components of clinopyroxene (dark) and plagioclase (light) (NMW 51.194.GR.11). Figure 2. Top right, coarser pegmatitic gabbro, with the same mineralogy as the dolerite, from a pod cutting the dolerite. Gimblet Rock, Pwllheli (NMW 30.202.GR.35).

shows that dolerite predominates and there are many examples of where it is cross-cut by the patches of coarser gabbro pegmatite. Some of these patches are well-defined while others are more diffuse blobs. These varieties can also be observed in the kerb stones along Penlan Street (Fig. 3) and as both kerb stones and buildings in the area to the west of the station.

The Old Town Hall (facades seen in both Penlan Street and Market Square) is built from dolerite, as regular ashlar blocks. For the greater part this is relatively homogenous dolerite, although above the door at the southwest end of the building, and in the lintel of the top window, pegmatitic patches can be observed. The attribution of the source of this stone to Gimblet Quarry is more tentative, as even though pegmatitic patches are present, no archive record (to date) has been found to indicate that the quarry was worked in the early part of the C19th.

The first archive evidence of working is from 1858, when

Figure 3. Gimblet Quarry kerb stone, northwest side of Penlan Street, showing dolerite cut by gabbro pegmatite. Photo A. Haycock.

a 21year lease was issued to Watkin Meryick Jones of Birkenhed, trading as the Liverpool and Pwllheli Granite Company. The annual rent was £5.0.0 with royalties of 2d per ton for (building) stone and 1d per ton for small paving stone. This lease was surrendered just 4 years later and reissued to Thomas Jumip of Liverpool, again on 21 year lease, but with an increased rent of £5.5.0. Documentation after this is a little sparse, but it is assumed that it continued working. Letters to the County Surveyor of Caernarvon in 1911, report the Pwllheli Granite Co. Ltd account of rents and royalties for 1907-1909, and a lease dated 1918.

The quarry initially opened in response to the increased demand for paving stone, in the late C19th, as industrial cities expanded. A small dock and jetty was present at the quarry to transport the stone by boat, but once the railways opened stone may only have been transported by boat as far as the railway line. The quarry is now infilled and occupied by the Gimblet Rock Holiday Park, with only small exposures of the lithology visible on the foreshore.

Young, T.P., Gibbons, W. & MacCarroll, D, 2002. Geology of the Country around Pwllheli. *Memoir of the British Geological Survey,* (England & Wales) Sheet 134.

The Co-operative Granite Quarries, Aberdaron

Mike Statham

The day before the start of the Welsh Stone Forum field meeting to the Lleyn Peninsula, in September 2019, I took a trip to Bardsey Island. On the way back I spotted a little harbour at Porth y Pistyll (SH 1606 2475) (Fig.1). It is adjacent to Bodermid Isaf farm and lies about a kilometre south of Porth Meudwy, where the slipway used by the Bardsey Island ferry is located. Although there appeared

Figure 1. Top, Porth y Pistyll harbour, near Aberdaron. ©Mike Statham. Figure 2. Bottom, Quarrymen's cottages, Bodermid Isaf, Aberdaron (Enigmatic ruin © Jonathan Wilkins cc-by-sa/2.0 :: Geograph Britain and Ireland, https://www.geograph.org.uk/photo/4231454.

to be no proper landward access to this little harbour, the cliffs looked as though they had been quarried. The skipper of the ferry told me that before WW1 there had been a quarry there which produced granite setts. However, the rock is actually dolerite, part of the Pen y Cill sill. The sill is an igneous body intruded parallel to the host Ordovician sediments and is roughly 150m thick and is exposed in the cliffs for about 4km along the coast.

Neither the Ordnance Survey map nor the British Geological Survey (BGS) Memoir for the area mentions a quarry at this location, although the BGS online archive holds photographs of a thin section of a sample from'the cliff at Bodermyd Isaf Quarry'. The Royal Commission on Ancient and Historical Monuments also had no entry for the site. However, some research done by others and published on the private website www.Rhiw.com, plus a search of the website www.britishnewspaperarchive.co.uk quickly revealed that a quarry at this location had been registered in 1907 under the name of The Co-operative Granite Quarries Ltd.

This company had taken over a small existing quarry served by a timber jetty, that was built in 1905. In 1908 the harbour was improved and deepened, and the jetty replaced with a stone quay. The production of setts and macadam for road making then got underway. The company only appears in the Government's annual List of Quarries in 1909, when it was stated to employ 26 persons, although it is listed in the 1910 Trade Directory for the area. At this time dolerite was being quarried on the cliff top at Craig Cwlwm, a little to the northeast, from whence it was taken by trams to a steam crane and lowered to the harbour. Attrition tests on stone from this location, to ascertain its suitability as a road stone, were published around 1907 and, in June 1909, records show that setts and macadam for Lancashire County Council and Rochdale Corporation were transported by sea to Preston. The company also had grand plans for a model village to house the workforce and two quarrymen's cottages were built with stone from the quarry, the roofless remains of which still survive (Fig.2). However, the enterprise was both under financed and almost certainly financially unviable and folded, probably sometime in 1910.

An attempt was made to reopen the quarry and improve the harbour in the 1930s under the name of the Allied Quarrying and Coastal Company and, whilst some setts and macadam may have been produced, nothing was sold, and the venture failed around 1937/8. A fully referenced history of these enterprises, which is a fascinating story in its own right, has been written and will hopefully be published elsewhere in the near future.

Font of the Year

Mike Statham

In September of 2018 we visited the St Mary of Antioch church at Bodelwyddan in Flintshire. It was designed by John Gibson and financed by Lady Willoughby de Broke in memory of her husband, the 16th Baron Willoughby de Broke. It is famous for the extravagance lavished upon its construction, with its shining white exterior of locally quarried Carboniferous Limestone, including a 62m tall

spire, together with the use of a great variety of marbles, both Welsh and imported, in the interior. Known locally as 'the marble church', it cost £60,000, took four years to build and was consecrated in 1860.

The church's font is carved from pure white Carrara marble from Tuscany. It sits on an octagonal plinth of polished Rouge Belge, a Devonian marble from the Wallonia region of Belgium. It was the creation of Peter Hollins in 1862 and was a gift from Sir Hugh Williams, brother of Lady Willoughby de Broke. It consists of two children, modelled on Sir Hugh's daughters, Arabella (b1853) and Mary (b1856), with Arabella in genuflection holding a scallop style shell on her bended knee, whilst Mary, who is standing, has her right arm affectionately resting on her sister's shoulders with her left hand on the back of the shell (Fig.1). Hollins based his composition on the world-famous font designed and carved by Bertel Thorvaldsen for the Church of Our Lady in Copenhagen c1820 (Fig. 2). Presumably it was Sir Hugh's idea to swap the heavenly angel for his

Figure 1. Bodelwyydan font.

Figure 2. Thorvaldsen's font Copenhagen.

Figure 3. Font All Saints church, Pen-y-fai during installation c.1904.

Figure 4. Former font of All Saints church Pontardawe.

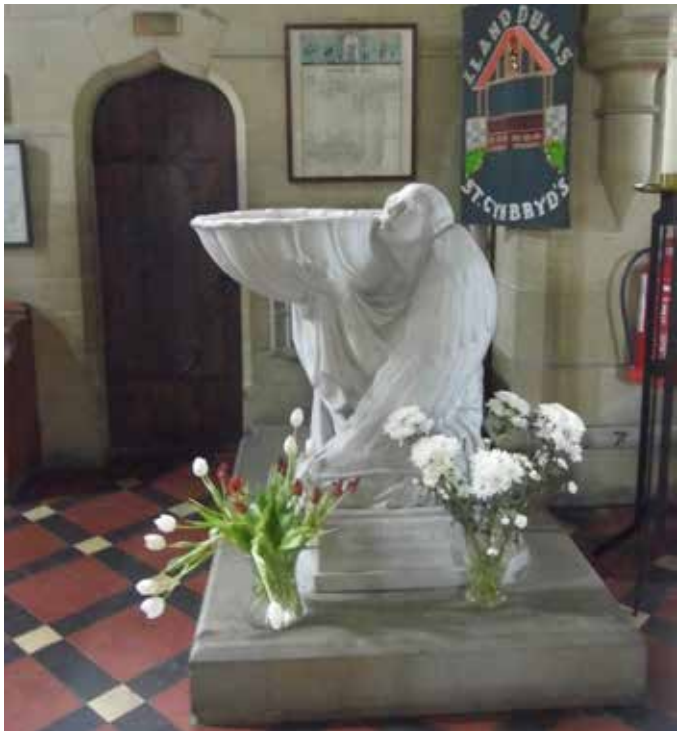

Figure 5. Font, St Cynbryd's church Llanddulas.

own little earthbound angels? Thorvaldsen had doubtless derived his inspiration from earlier Italian examples of angels holding shells, such as the holy water stoup in St Mary of the Angels and Martyrs in Rome. However, I believe the angel posed in genuflection was his idea. The design has been much copied worldwide, for example in St Andrew's Cathedral, Inverness by James Redfern (1871) and St Giles Cathedral, Edinburgh by John Rind (1883), but we do not need to go to Scotland to see copies, there are plenty in Wales! D & A Davidson of Inverness made a fine copy for St John's church in Barmouth in 1894. while in south Wales, All Saints church, Pen-y-fai, near Bridgend has a copy made at the workshop of W. Clarke of Llandaff (Fig. 3).

A copy was also made for All Saints church, Pontardawe, which was moved to St Mary's, Ynysmeuddwy, in 2010, when All Saints Pontardawe closed and was converted to a private dwelling. St Mary's has now also succumbed to the same fate, though the font was still present when I visited in 2015 (Fig. 4). A further variant on the theme is the font in St Cynbryd's church, Llanddulas, in Denbighshire (Fig. 5). I will leave you to decide what you think of that one, but the description offered by Hubbard in *The Buildings of Wales - Clwyd* (Penguin 1986 p191) is hardly complimentary.

References

https://www.geni.com/people/Sir-Hugh-Williams-3rd-Baronet/6000000036311713633 Accessed 10/11/2018

Acknowledgments

Figure 2: By Ib Ramussen - own work Date=2006-09-02, all rights released public domain. https://commons.wikimedia.org/ wiki/ File:Vor_Frue_Kirke_Copenhagen_font.jpg. Figure 3: Courtesy and copyright of W Clarke, Llandaff. Figure 4: Thanks to Elizabeth Williams for allowing me to photograph the inside of the former church of St Mary, Ynysmeuddwy. Figure 5: Courtesy of Dr Mark Baker.

More on limestones from the Lower Jurassic, Bull Cliff Member

Mike Statham

In the last issue of the Newsletter (2019) Statham & Lee described the use of limestones of the Bull Cliff Member (Jurassic, Blue Lias) for flooring in medieval and later buildings in south Glamorgan. During a subsequent visit to south Somerset use of similar age limestones was noted in several medieval churches including Bishop's Lydeard and Broomfield (Fig.1).

Figure 1. Floor slabs, Broomfield church, Somerset.

James John Moon's Alabaster Fonts

Mike Statham

Recent research has revealed that one James John Moon (1853-1955), who had a long association with Barry Docks and was a Captain of the local Boys Brigade, also had a hobby. This was sculpting baptismal fonts from Penarth alabaster, which he apparently donated to a variety of chapels. The only example of his work so far traced is in the Wesleyan Chapel in Watchet, now used by the local Catholic community. It could well be that this font is actually carved from Watchet alabaster rather than Penarth. It was donated to the chapel in 1931 (Fig.1). A search for south Wales examples of Mr Moon's work continues.

Thanks to Robin Adeney webmaster of West Somerset Catholics for the photograph. *Western Mail,* 2 Nov 1953. He can recall the young days of Queen Victoria. *Western Mail,* 15 March 1955. Man who saw port grow dies at 101 https://westsomersetcatholics.org.uk/watchet accessed 20.12.2019.

Field Meeting Reports

Tefi Valley, May 11th 2019

Jana Horak

The Lower Tefi Valley trip was led by Tim Palmer, with the first stop at Llandygwydd. Details of the demolished church and the abandoned font were documented by Tim In Font of the Year 2018, *Newsletter* **16**, so won't be repeated here.

Returning to our vehicles, we passed two buildings, the former infants' schoolroom built by R J Withers, which is now used as the church (Fig. 1) and a second schoolroom built in 1846 by Charles Davies which is now used as the church hall. Both buildings are built predominantly of the local Cligerran Slate. Blocks in the original fabric have a

Figure. 1. Former infants' school, Llandygwydd.

Figure. 2. Old fabric left, new sawn blocks, right.

hammered (or pecked) finish, whereas newer blocks used for infill and extending the building are simple, and less aesthetically pleasing, sawn blocks without the decorative finish (Fig. 2).

The next stop was St Dogmael's Abbey. Although the Abbey has been mentioned in the *Newsletter*, and informal trips have been made previously, this was the first time the Forum had formally visited the site. Tim provided background to the abbey, outlining that the monks were of the Tironian order with a motherhouse in Tiron, close to Chartres. The monks were required to be skilled craftsmen. The stone buildings are predominantly of the C13th to C14th, with a later remodelling of the C16th northern transept. For further details of archaeological aspects of the site see https://coflein.gov.uk/en/site/94164/details/st-dogmaels-abbey-st-dogmaels.

We inspected the fabric of the remaining walls in the abbey. In particular the style of the stonework was noted. In the transept a pattern of flat binding layers of flat slabs was observed interspersed with thicker layers of sandstone rubblework (Fig. 3). This style of stonework has been said to mirror that in the motherhouse in France, which has raised the suggestion, by others, that stone for the St. Dogmael's had been imported from that area. This was rapidly refuted by inspection of the walling, which revealed that the flat slabs were of cleaved mudstones (Ordovician age) and the blocky layers of turbiditic sandstone (Silurian age), both of local origin. This does not fit with the local geology of Chartres of Cretaceous

Figure. 3. St. Dogmael's Abbey trancept.

to Paleogene sediments. However, the physical properties of the rocks in France, e.g. flaggy sediments and thicker bedded sandstone, may have allowed the first monks arriving from France to understand how to build with the materials available locally that St. Dogmael's. Inspection of the walling also revealed two other lithologies of interest. Firstly, occasional rounded boulders of granite, which may be derived from the glacial deposits, with an original provenance in Ireland. An alternative possibility is that they could be ballast stones, once again most likely derived from Ireland where trade was most prolific in medieval times. These are worthy of further study, subject to Cadw allowing some gentle sampling! The second lithology of note is a cemented iron regolith deposit used to fashion quoins. This has been noted previously in *Newsletter* **2** (Robinson, 2004) and is a distinctive iron–rich breccia, forming as a superficial deposit by the cementation of weathered bedrock deposits (previously called ferricrete). This lithology has been described by Davies et al. (2003) and Lamplugh (1902).

A brief stop was made at a local farm, where Cadw stored masonary from St Dogmael's. Once again a variety of lithologies were noted and the possibility to make a

Figure. 4. 'Ferricrete;, St. Dogmael's Abbey.

proper survey of these was suggested. One more project for the list! The last stop of the day was Meline church. This showed the use again of the 'ferricrete' as a building stone. Tim was then thanked for an excellent day in the field.

Robinson, E., 2004. Ferricrete at St Dogmaels St Dogmaels. *WSF Newsletter,* **2**, p3.

Davies, J.R., Waters, R.A., Wilby, P.R., Williams, M. & Wilson, D. 2003, *Geology of the Cardigan and Dinas Island District Sheet 19*3, British Geological Survey, pp 1-26

Lamplugh, G.W.1902, "Calcretes", Geological Magazine, 9, p 575

Stone Resources along the Montgomery Canal

15th June 2019

John Shipton

Members assembled at the Llyn Coed y Dinas Nature Reserve, near Welshpool, to examine the stone resources along the Montgomery Canal. The leader, Andrew Jenkinson, explained that he had once lived near to a canal tunnel in London and this had led to an interest in tunnels and the geology exposed along their length. He showed us a copy of a very early geological map (*circa* 1820) detailing the canal network and related geology, and went on to explain that the alternative to canals at that time were pack horses as very few railways existed. He explained that the Montgomery Canal was described as an agricultural canal but that it actually carried industrial materials; coal from southeast of Oswestry and limestone predominantly from Llanymynych. From our starting point we had good views across Llyn Coed y Dinas to the hills beyond, which are composed of Silurian and Ordovician age rocks.

We moved on to Powis Castle (previously visited by the Forum in 2007) which is built predominantly of Silurian conglomerate (Fig.1) found in the hills east of Llyn Coed y Dinas. As well as rock pebbles the rock also contains fossil corals which it is thought were growing on the lower levels of a beach. The main castle building also contains dressings of a red mottled Triassic sandstone, which Andrew Haycock thought came from nearby Ruyton. A pale sandstone, used in the stairway and wall walk balustrade, was identified by Andrew as Carboniferous Cefn Sandstone from northeast Wales. Other stones include Grinshill Sandstone, with its prominent calcite veins and, in more recent replacement dressings, a red mottled stone thought to be possibly Hollington Stone from Staffordshire.

Leaving Powis Castle we stopped to look at the aqueduct that carries the Montgomery Canal over the River Vyrnwy (Fig. 2). Andrew Jenkinson explained that it was built between 1794 and 1796 of what is thought to be Cefn Sandstone. The aqueduct is a Grade 2 listed structure as it was one of the last clay-lined aqueducts to be built. Much iron work has been employed to reinforce the structure, which may well have been carried out around 1820 when a major phase of repair work was undertaken.

We took lunch at Llanymynach, which straddles the border between Shropshire and Powys. On the crossroads in the centre of the village stands the Georgian Grade 2 listed Cross Keys Hotel (Fig. 3) where we stopped to observe the finely cut Carboniferous Limestone ashlers used in the construction of the front and side elevations. These were probably quarried locally from the Carboniferous Limestone beds that outcrop to the north of Llanymynach. After lunch we took a short walk up the road to the Montgomery Canal, which carried limestone from the quarries in the area, including the Butchers and Llynclys quarries, which worked the lower limestone beds (Leete Limestone and Loggerheads Limestone Formation), and the Dolgoch Quarry which worked the upper beds, previously referred to as the Grey Limestone (Cefn Mawr Limestone Formation). This section of the canal was opened in 1797 when the Montgomery Canal was connected by a branch to the Ellesmere Canal at Llanymynach. However, the canal was officially abandoned in 1944 and today only a few sections are navigable, including the short section at Llanymynach.

We then visited the Llanymynach Limeworks Heritage Area, where, from the mid C18th, limestone had been quarried and burned to produce lime for local purposes. Quarry output was increased in the early C19th when a tramway was constructed to transport the limestone to the canal. During the mid C19th two traditional lime kilns were

Figure. 1. Powis Castle, mainly built of Silurian conglomerates.

Figure 2. Aqueduct over the River Vyrnwy, probably built of Cefn Sandstone.

built but were abandoned around the turn of the C20th, following the construction of a more efficient Hoffman Kiln on the site in the late C19th. Members spent some time reading the interpretation panels and the restored Hoffman Kiln, which is one of only three remaining in the UK (Fig. 4). Originally designed by Friedrich Hoffman in the mid C19th for brick production, it was later used for the continuous production of lime.

We headed back towards Welshpool and stopped by the River Severn, at Pool Quay. Looking east across the river Andrew Jenkinson pointed out a quarry that he told us was producing crushed green dolerite that is used predominantly for road stone. However, a stone wall near where we parked that morning to view the aqueduct contained a green igneous rock, along with Carboniferous Limestone, and Andrew suggested that this green rock may well have come from this quarry.

Our final visit of the day was to the Standard Quarry in Welshpool. This quarry works a green-grey, fine grained dolerite, of Ordovician age, which is used extensively in the area around Welshpool, particularly on the Powis Estate. Andrew pointed out good examples of columnar cooling joints in the abandoned quarry face. As the weather was closing in we thanked Andrew for arranging the trip and went our separate ways.

Fig. 3. The Cross Keys Hotel, Llanymynch. Carboniferous Limestone ashlars.

Figure 4. Inside of the Hoffman Kiln, Llanymynach.

Grosmont and surrounding area, Gwent

13th July 2019

John Shipton

In the fertile farmland between the natural boundaries of the Welsh hills to the north and the river Wye to the south, the Normans built the 'Three Castles' of Grosmont, Skenfrith and Whitecastle to control access through the area. Due to the strategic importance of Grosmont Castle a small market town sprang up around the castle in the C13th and it was here, in the Parish of St Nicholas, that 16 members were treated on arrival with hot beverages and homemade cakes and biscuits baked and served by Eric Evans' wife Rebekah and his daughter Bronwen.

Following the much appreciated refreshments Eric briefed us on the C19th restoration of the C13th church. The early stone church was built in several phases spanning the period from about 1180 – 1300 with the north porch, bell tower and spire being added later. Unfortunately, the arches to the crossing were never intended to take the weight of the bell tower and spire and, by the C19th, some very serious structural defects had become apparent leading to John Pollard Seddon (whose work Forum members have seen previously in the Old College Building in Aberystwyth) being employed to restore the church in the early 1870s. Seddon rebuilt the majority of the C13th

chancel and Eleanor Chapel, which was in an advanced state of decay, re-using some of the original masonry. He also replaced most of the tower piers and arches to save the octagonal tower and spire from collapse.

Before looking at the restoration works we moved to the nave, which had been isolated from the remainder of the cruciform-style church and had not been part of the restoration project. Eric explained that in 2009 the Royal Commission for Ancient and Historical Monuments in Wales commissioned a study, which included the extraction of core samples from the oak nave roof timbers. Tree ring dating of these gave felling dates within the range 1214-1244, which meant that this was the oldest known church roof in Wales.

The fabric of the church is built predominately of sandstone from the St Maughans Formation, a unit within the lower part of the Old Red Sandstone (Devonian). This occurs in a variety of colours from red through to purple and grey/green. The Church Warden, Russell James, who was kind enough to show us around, explained that it was thought locally that the stone had been quarried within a mile of Grosmont, at Trevyr, which lies to the south.

Burials had taken place within the nave until around 1840 when the bodies were exhumed and reburied outside as the smell was becoming unbearable. Some of the grave slabs had since been brought back inside but, for some unknown reason, had been re-laid on a north/south axis instead of east/west. Andrew Haycock thought that these slabs had been cut from stone also from the St Maughans Formation. In the north west corner of the nave lies a large, crudely carved, tomb effigy (Fig. 1). also thought to be cut from local stone. We spent some time inspecting the effigy but there was no clue as to who it was supposed to represent. On a windowsill in the south aisle are a number of smaller carved slabs, which Maddy Grey thought could have been for heart burials.

We moved into the restored section of the church past the stone pulpit, designed by J.P.Seddon, the stone being of an unknown grey sandstone with Penarth alabaster (Fig. 2). In the vestry, mounted on the wall, is a memorial slab to the Springet family. This is a re-used slab and inscribed on the back is a grave cross and the letters IHS. IHS became the 'trade mark' of Jesuit Catholic imagery and Maddy told us that there was a Jesuit College close by, just across the river.

Returning to the chancel the stone floor slabs have been replaced with a variety of Victorian tiles, some of the large decorative ones having been made by the William Godwin Tile Factory at Lugwardine, east of Hereford. In the south wall of the chancel Seddon had included an original C13th

Figure 1. Crudely carved image probably in the local Old Red Sandstone.

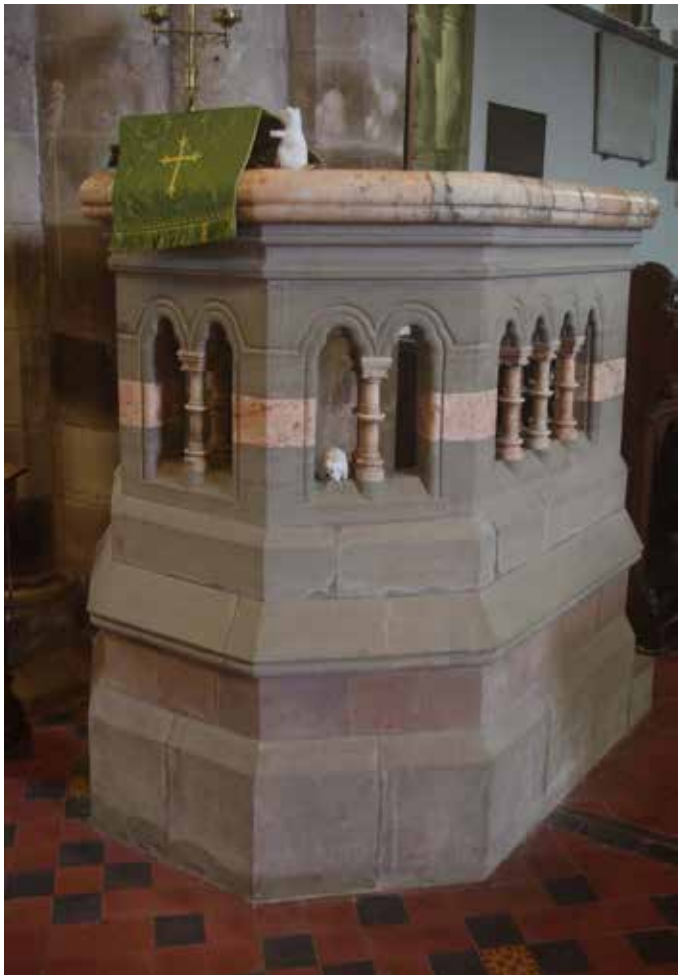

Figure 2. Pulpit of unknown grey sandstone with Penarth alabaster.

Figure 3. C12th piscine of St Maughans Formation sandstone.

double piscine, which had been elaborately cut from local St Maughans Formation sandstone (Fig. 3). Also in the chancel are a number of small diameter columns. A close inspection of these was not possible, due to their elevated position, but they appear to be very fine-grained and so it was wondered whether they could be artificial stone, especially as Seddon had used Ransome's artificial stone in the Old College Building in Aberystwyth. Finally, in the wall of the south transept, stands a large memorial cut from local sandstone celebrating the life of Charles William and his wife, Joan Baker, cut sometime after his death in 1636.

After a brief look at the outside of the church, where the variety of colours within the St Maughans Formations sandstones is well shown, we moved on to Grosmont Castle. Originally a timber structure, the majority of the masonry structure was erected between 1200 and 1360. Some later work had been carried out but by the C16th it was in a ruinous state. Almost without exception the standing masonry is of local sandstones, the majority being from the St Maughans Formation, but also with some pebbly beds from the overlying Brownstones Formation (Fig. 4). The Brownstone Formation forms, and crops out on, the slightly higher ground to the east of the castle. The majority of dressings used for the windows and doors have been robbed out, probably for re-use elsewhere. From the castle ditch/moat that surrounds the castle, it was possible to observe the beds of Old Red Sandstone on which the castle stands. It is probable that much of the rubble masonry used to build the castle came from the excavation of this ditch.

Following lunch we set of for St Teilo's Church Crosseny, stopping briefly to look at the New Inn Well House at Cross Ash. The Well House is a Grade 2 listed building, which is thought to date from around 1770. However, by the 1970s the supply of water became inconsistent and the New Inn introduced other arrangements for their water supply and the Well House fell into disrepair. In 2004, a 'Village Alive Trust' was formed to raise funds for its restoration. Fortunately, all of the original masonry had been retained on site and with the aid of old photographs a faithful reconstruction took place. From the roadside where we stood the masonry appeared to be local sandstone.

The car park at the Church of St Teilo's, Llantilio Crossenny, has a stone wall approximately 3 metres high built of local sandstone. The village is located on Raglan Mudstone Formation, so it is more likely that sandstones are derived from the overlying and geographically surrounding St Maughans Formation. Once again the random rubble blocks provided evidence of the wide variety of colours and grain size that are available in the local rock.The majority of the current cruciform-style church was built in the C14th but the tower is C13th and further additions and alterations took place right up to the mid C19th, when the church was restored by John Pritchard and John Pollard Seddon. Entering the C14th porch we noted that many of the blocks of stone are very gritty local sandstones but the dressings to the door are quite green and had a strange feel to them. Was this another example of Seddons' use of artificial stone?

Figure 4. Pebbly Brownstones, Grosmont Castle.

Internally the Bath Stone dressings to the door and windows are Victorian in age. The octagonal piers and gothic arches between the nave and aisles are again of a gritty red and green sandstone, which Andrew Haycock attributed to the St Maughans Formation. Elaborately carved grave slabs in the chancel are cut from a fine-grained sandstone that was thought to be local but, due to its age and polished surface, positive identification was not possible. A white memorial plaque in the north chapel

Figure 5. Carrara Marble memorial plaque on a possible Cornish serpentine backing.

is worked from Carrara Marble on a dark, probably Cornish, serpentine backing (Fig. 5). In the south west corner of the chapel is what looked like a font bowl, probably made from a local sandstone, which is obviously quite ancient but it is missing its base and there was no explanation as to what it was or why it was abandoned in a dark corner. On the way out members inspected a much larger font in the north aisle. Information within the church stated that it had been found in the churchyard and was thought to be early Norman or possibly late Saxon in age. Upon inspection it was noted that it was cut from a medium-grained sandstone sat on a pebbly Brownstone circular base.

Our final visit of the day was to the largest of the three castles, White Castle, which is surrounded by an impressive defensive array of deep, water-filled moats and ditches. The earliest masonry structures are the C12th curtain walls that surround the inner ward and the square (later demolished) keep within. The castle was originally approached from the south, over the defensive horn work, but in the C13th the castle was turned around with a new entrance inserted to the north between two massive new towers (Fig. 6). At the same time four further towers were added to the C12th curtain wall and a further curtain wall erected around the outer ward.

Figure 6. The C13th entrance to White Castle of St Maughans Formation sandstones.

Like Grosmont the majority of the castle's dressings have been robbed out and the remaining standing masonry is of local sandstone, predominantly from the St Maughans Formation. Although the banks below the inner curtain wall and the horn work are now covered with brambles and undergrowth, the author remembers, on visits to the castle twenty years ago, that there were sandstone outcrops on the banks below the walls and there are photographs to support this. It is therefore perfectly reasonable to presume that much of the material required to build this impressive structure was quarried from these deep ditches. Inspection of the geological maps confirms this as a prominent band of sandstone within the St Maughans Formation outcrops to the immediate east of the castle. As it was late afternoon and some members had a long trip home we thanked Eric for organising the interesting and informative trip and ask him to pass on our thanks to Rebekah and Bronwen for the refreshments on our arrival at Grosmont.

Field Trip North West Wales September 2019

John Shipton

The annual two-day excursion once again found us in north Wales with the focus this time being the igneous rocks of the Llŷn and northwest Wales. The trip was led on Saturday by Jana Horak and on Sunday by Ruth Siddall.

On a fine Saturday morning we assembled outside the visitor centre at Criccieth Castle where Jana explained that there was now general agreement that the castle was built in three phases; the inner ward and gate towers before 1240, the outer ward before 1282 and Edward I modifications between 1283 and 1292. Each phase could be easily identified as the builders had used different stone or style in the masonry of each period of building. Richard Avent, late Chief Inspector of Ancient Monuments for Cadw wrote in 'A History of Criccieth Castle, Problems of dating' that each building phase could be identified because the mortar of the three different phases contained different aggregates.

Jana distributed an informative handout containing details of the locations that we intended to visit and a useful guide to how the local igneous rocks were classified and named. She then explained that much of the igneous rock on the Llŷn was covered by thick layers of glacial deposits and much of what was available actually did not provide good building material, which is reflected in the amount of rubble work fabrics that are often rendered.

Although there were some intrusions in the Ordovician sediments, much of the building work in the area was of timber due to the lack of good building stone. Andrew Haycock passed around some felsite and rhyolite from the museum collection that was typical of the rock used in the construction of the castle.

Making our way up the path to the castle we passed outcrops of rhyolite (Fig. 1), the columnar jointing of which aided the extraction of the stone for building. Reaching the gatehouse we observed dark sandstone from the Porthmadog area, of Early Ordovician age (Tremadocian), incorporated into the build alongside the local igneous rocks. Members spent a little while discussing the possible sources of limestone for the mortar and eventually came to a consensus that it most likely came from Anglesey. The inner gatehouse tower door jambs are cut from a gritty sandstone considered to be of Namurian age from Malltraeth on Anglesey, a conclusion informed by recent fieldwork by David Roberts. In the southeast tower, which was refaced as part of the Edward I rebuild, we found a slightly reddened, fine grained sandstone containing some pebbles. Although it resembled sandstone from Anglesey it was different to that which we normally observe, and it was suggested that it might have come specifically from Mol-y-don. We spent quite a while discussing the possibility that the reddening was due to fire damage but Jana was unsure.

Moving around the castle we observed glacial boulders and igneous rock displaying columnar jointing in the core work to the curtain walls. Reaching the southwest tower we noted that the door jambs used in the Edward I modifications are cut from the same sandstone as used in the door jambs and the portcullis slots in the inner gatehouse.

Leaving the outer ward and walking down the access track on the west side we could see the very large ditch, the potential source of the pink rhyolite used in the construction of the castle walls. Before leaving we scrambled up the grassy bank to the base of the north (Engine) tower. Here we saw a flaggy, muddy sandstone, which had been subject to heat, and a fine grained, cleaved sandstone that Jana suggested had probably come from between Criccieth and Porthmadog (Fig. 2).

Walking down the hill, away from the castle, we passed cottages built in local stone, some of which may well have been removed from the castle walls. We also passed a cottage where an old millstone, of Anglesey Grit, had been set in the ground to divert water running down the hill away from the cottage door. At the bottom of the hill stands the lifeboat station where fine-grained sandstone ashlars have been used in the door jambs. On inspection Andrew considered them to be fine-grained Gwesper Sandstone. Next door the walls of the RNLI shop are built predominantly of Trefor granodiorite but the jambs to the window and door are of a pale unidentified sandstone that might have been Triassic, or possibly Grinshill.

After lunch we moved on to Pwllheli. Jana explained that although this is the principal town on the Llŷn there are few buildings of note older than the C19th century preserved. We first came upon the HSBC Bank building, built in the old Midland Bank style, of pale sandstone and red brick (Fig. 3). The sandstone was identified as Gwesper, but was devoid of typical interstitial clay, which David Roberts attributed to the effects of cleaning by sandblasting. We passed cottages built using Llanbedrog granophyre, a course grained intrusive igneous rock before reaching the old early C19th Town Hall. This is built on the site of an earlier guildhall and the builders had used local dolerite/gabbro from the Gimblet Rock Quarry. In 1902 the council moved into the new Town Hall which is constructed of Rhuabon brick, that had become widely available following the arrival of the railway. The nearby Tabernacle was built in 1861, just before the arrival of the railway and Coflein (https://coflein.gov.uk/en/site/6801/details/tabernacl-welsh-baptist-chapel-penlan-street-pwllheli) states that the façade is of re-used ships' ballast from Penycae (whether this is Denbighshire or the Upper Swansea valley is not indicated). However, this is clearly a misidentification as this lithology is the dolerite/gabbro from Gimblet Rock Quarry (see earlier article on Gimlet Quarry). The dressings are of Penmon Limestone from Anglesey showing an abundant fossil content, especially corals, and also strongly developed serrated stylolite surfaces.

The last building that we visited in Pwllheli was the Penlan Fawr Inn, claimed to be the oldest building in Pwllheli, which is thought to date from the C16th with some C17th additions. It is built of field cobbles and a flaggy sandstone from Llanbedrog. Columns outside the front door are of a volcanic tuff, from the local Ordovician sequence. The columns had once been hexagonal but they had long since lost their geometric shape due to erosion.

Tea was taken at Plas Gwyn y Weddw (Fig. 4), built in 1857 for Elizabeth Jones Parry, which like many large country mansions has had a chequered history. However, a charitable trust was formed in the mid 1990s to run the gallery that the building housed and, in 2008, the adjacent 12 acre woodlands were purchased and a network of paths reopened. The main fabric of the house is of local Llanbedrog Granophyre (formally known as Mynyydd Tir-y-cwmwd Microgranite), a fine-grained granite derived from the headland to the west. The stone is arranged as random-coursed or broken-coursed ashlar cut blocks with Penmon Limestone employed for the quoins and dressings, closely resembling that seen in the Tabernacle in Pwllheli. Inside the porch are examples of early use of stone in the area; a pair of early medieval (C5th/6th) inscribed stones from Llannor, to the north of the arts centre. Both are unmodified columnar-jointed pillars of locally-derived acid volcanic rock (Horak, 2013). Jana stated that these were used as grave markers.






Figure 1. (Top left) outcrops of rhyolite below Criccieth Castle. Figure 2. (Top right) cleaved sandstone, the Engne Tower, Criccieth Castle. Figure 3. (Middle left) the HSBC Bank, Pwllheli. Figure 4. (Middle right) Plas Glyn y Weddw, mainly of Llanbedrog Granophyre. Figure 5. (Bottom left) Tan y Mynydd quarry and timbers from the old jetty. Figure 6. (Bottom right) pink and green volcanic rock in Victorian work to the east end St Aelhaearn's Church.

We then moved on to the abandoned quarry at Tan y Mynydd, the most southerly quarry in Llŷn. The towering quarry face gave some indication as to the amount of rock that had been extracted from this site, for use predominantly for kerb stones as well as a building material. We made our way down to the beach and walked the short distance to a second quarry. Jana told us that this quarry was active from the 1870s to late 1950s and the timber posts on the beach were the remains of the timber jetty used by the quarry (Fig. 5). Drill holes in the rocks below the second quarry face provide evidence of the earlier quarrying. We walked back along the beach to our cars and left for our overnight accommodation.

On Sunday morning a few of us had an early start and visited St Aelhaearn's Church at Llanaelhaearn, where we were able to view the variety of volcanic rock that was available in the area. The nave is early Medieval but both transepts were added later before the whole church was refurbished in 1892. Jana pointed out that much of the original fabric is composed of blocks of jointed volcanic rocks (predominantly dacite) and tuff, while the Victorian work is of pink and grey blocks of microgranite from Trefor quarry to the northwest (Fig. 6) with window dressings in a sandstone resembling Cefn Sandstone. The east end Victorian gable has a tall, three light window with mullions and vousoirs of a conglomerate that Jana

Figure 7. Clwyd Limestone Group limestones in new buildings in Victoria Dock, Caernarfon.

suggested came from the Carboniferous sequence at Caernarfon or the Menai Straight. Jana, who had earlier managed a quick look inside, informed us that the Victorian chancel arch was built of a sandstone with iron nodules suggesting it was Gwespr Sandstone. Before leaving we spotted another early medieval (Roman) inscribed stone, of volcanic origin (andesite) embedded in the ground adjacent to a Yew tree, which exhibited good jointing, while in the church wall we spotted more large green blocks and smaller blocks of pink-coloured fine acidic tuff.

Arriving in Caernarfon we parked near the old Victoria Dock. Most of us were quite impressed with the new buildings that lined the east side of the dock, which are clad predominantly with limestone that Ruth Siddal, today's leader, informed us was from the Clwyd Limestone Group that occurs in north Wales and Anglesey (Fig.7). It was good to see local materials being used in a new-build. However, the paving slabs, that had been installed prior to the new buildings around the docks area, probably originated from Yorkshire. The walls to the C19th Victoria Dock are built in Penmon (Marble) Limestone, the blocks of which around the edge of the dock exhibit some large fossils (brachiopods and corals) as well as iron-filled fractures.

We moved on to inspect the front wall of one of the warehouses built on the south side of the dock (built in about the 1870s), whose wall is built of a variety of rubble blocks with clay pipes built in at regular intervals (Fig. 8). It was obvious that whatever was stored in the building required plenty of ventilation but there was no clue as to what this had been. The rubble was most likely derived from probably ballast but Ruth pointed out a red sandstone, which she called a mystery stone, telling us that it crops up elsewhere in Caernarfon but she had no idea where it came from. Other rocks visible in the wall are serpentine and a spotted igneous rock that was probably Cornish granite. The side of the warehouse is also built predominantly of ballast, including blocks of Cornish granite containing tourmaline, granodiorite, a course conglomerate (probably Anglesey Grit), one block containing a pebble that looked like jasper and more of the mystery red sandstone. One block also appears to contain a plant fossil.

The Yacht Club walls are built of what Ruth believes is Irish granodiorite with dressings of Portland Stone. Granite from Dumfriesshire is an alternative possible source but circumstantial evidence points toward an Irish source as it had been used widely elsewhere in the town. A circular bell tower to the church (Fig. 9) is built in limestone from the Carboniferous Clwyd Group in which two facies were observed; one drab flat grey the other more flaggy containing iron staining. Dressings to a ground floor window in the tower are, like those in the church, of an unidentified red sandstone and Cefn Sandstone. The Late C13th town walls contain a number of rocks including limestone conglomerate, possibly from Anglesey, in which some fossils are visible; a gritty Anglesey sandstone from within the Carboniferous Limestone sequence and another mystery stone, this time a gritty green sandstone that is possibly Carboniferous in age but which Jana believed to be more likely Ordovician. The Royal Welsh Yacht Club is built predominantly of the local volcanic rock. The irregular lengths of the Cheshire red sandstone window dressings suggest that the walls may well have been rendered in the past. Like the HSBC building seen on the day before it may well have suffered the fate of cleaning by sandblasting. This would have had little effect on the hard igneous rock in the walls but

Figure 8. Warehouse with clay pipes inset in to rubble walls, Caernarfon.

Figure 9. Circular church bell tower of Carboniferous Clwyd Group, Caernarfon.

the sandstone window dressings were showing signs of deterioration.

On the corner of High Street and Shirehall Street stands a substantial three story house. The elevation on Shirehall Street is built of the mystery red sandstone and this is present in some considerable volume suggesting that it may outcrop not too far away. A little further up High Street stands Plas Bowman, a large three story house, the front elevation of which has ashlars cut from Anglesey conglomerate. Some of the voussoirs over the windows look quite fresh and one of our group spotted that some, if not all, of the windows had new steel lintels over so it appears that this elevation had recently had some repair work sympathetically carried out. On the corner of Market Street is the Conservative Club, formally the Meat Market. Ruth told us that the first floor arcading was built in a quartz and carbon-rich sandstone possibly of Cambrian age. She went on to inform us that, with the exception of the later stages of the castle (late C13th), this was the only building in Caernarfon built of this stone, which outcrops by a roundabout on the outskirts of town. In the square, opposite the Council Offices, in Castle Street is a sculpture on top of a rough column of Penrhyn purple slate, in which several grey reduction spots are visible. Nearby, a pair of cottages in a terrace have their entire front elevation built of the mystery red sandstone. Across the road is the Masonic Lodge Chapel, built of grey granodiorite with pale sandstone dressings that have badly degraded where used in quoins to a buttress (Fig.10). Upon inspection it appears that they have been face bedded (oriented with a bedding plane parallel to the walling).

After lunch we walked up to the Roman Fort of Segontium which lies on high ground at the edge of town. It was built around AD 77-78. Looking across the Roman remains we could see Twt Hill where the Town End quarry is situated, which is likely to be the source of the apricot-coloured granite that can be found in the remains of the fort's masonry. In what was possibly a cellar Ruth pointed out blocks of tuffa in what looked like a string course. Nearby we saw where Penmon Limestone had been used for paving, in which a number of productid brachiopods are clearly visible. In the remains of the Roman walls we saw blocks of unidentified red sandstone, gritty sandstone and assorted granites. The granites could well be ballast and it was speculated that all three rocks may well be modern capping.

In the gatehouse on the northwest side of the fort we found a large piece of schist, a metamorphic rock that was originally mudstone or shale. Ruth suggested that it could be a re-used standing stone from Anglesey. Also on this side of the excavated site stands a two metre high Roman wall (Fig. 11) built of an assortment of local rock. In the northern wall we found more blocks of schist and on leaving the site we noticed a number of square column bases cut from a gritty rock, probably from Anglesey.

Our final visit of the day was to Llanbebic Church, just west of Segontium, whose fabric is predominantly C14th with an imposing C16th square tower. The church is built of coursed rubble and Ruth told us that it contained a number of interesting rocks. High in the tower a square window

Figure 10. Masonic Lodge Chapel with badly weathered columns and buttresses.

Figure 11. Roman wall, Segontium.

has louvers made from large slates and in the rubble a shaley horizon of Penmon Limestone contains large fossil productid brachiopods. The tower also contains a number of blocks of a badly eroded green sandstone of an unknown source where the very hard mortar used in the pointing is probably accelerating the degradation of the stone. A red sandstone quoin in the tower was thought to have possibly come from Chester. Red sandstone from Cheshire has been used for replacement dressings to a window on the south elevation whilst on the east side a window contains Anglesey grits (Fig. 12) in the early dressings but later replacements are of a pale sandstone that Jana thought was probably Triassic from Grinshill. On the north elevation a door has dressings in Gwesper Sandstone while an adjacent window has dressings of a pink/buff sandstone. Jana and Ruth thought that this was not local and might possibly be Grinshill. Replacements to this window are in either Gwesper or Cefn Sandstone,

Figure 12. Anglesey Grit, Llanbebic Church.

but the height of the window above the ground made close inspection impossible.

Back at the church gate the remaining members of the group thanked Jana and Ruth for organizing the trip and the meeting concluded at 16.00hrs.

Gwent Levels Churches 12th October 2019

John Shipton

The forum visited the Gwent Levels at the request of the ' Living Levels Landscape Partnership', an HLF funded scheme to reconnect people and communities to the Gwent Levels landscape and provide a sustainable future. One of the subjects promoted by the scheme is the built heritage and although the rock used in the construction of major historic buildings in the area i.e. Caldicot Castle (visited by the Forum in 2010) and Tredegar House (visited by the Forum in 2017), has been researched and detailed very little is documented about the materials contained in the half a dozen churches that sit on the Levels. Our visit was to review St Bridget's Church at St Brides in the morning and St Mary Magdalene's Church at Goldcliff in the afternoon.

At St Brides Wentloog (Fig. 1) Jana gave us an introduction to the type of rocks that we might encounter during the day and suggested that we keep our eyes open for the use of medieval Dundry Stone (see Tim Palmers article on Jurassic limestones in *Newsletter* **14**, 2017), as transportation across the Severn Estuary from the medieval quarry on Dundry Hill, south of Bristol, to the Gwent Levels would have been relatively easy.

Approaching the church from the east, along Church Road, we made our way to the C14th porch on the south elevation. Inside, we were shown a plan of the church drawn by a H.J.Thomas, dated November 1994, which illustrated how the church had evolved during the C15th and C16th. Although the porch was C14th the plan

Figure 1. St. Bridget's church, St Brides, Wentloog. Photo Graham Oliver.

indicated that the only other part dating from that period St Bridget's church, was a section of the nave wall on the north elevation. Two phases of work were carried out in the C15th; phase one was the construction of the Gothic-style western tower and phase two involved the re-modelling of the nave, as well as rebuilding the south wall either side of the porch and part of the north wall. The current chancel was built during the C16th and alterations to the entrance inside the porch were carried out at the same time.

Figure 2. Sr Bridget's church, St Brides. South wall to the east of the porch, of coursed Liasic limestone blocks and Triassic sandstone. Photo Graham Oliver.

Returning outside we noted that the porch is built predominantly of local sandstone random rubble with the odd Liassic limestone block but the dressings and quoins are a pale Jurassic limestone that in the absence of Tim Palmer, we were unable to positively identify. Moving anticlockwise around the building we noticed that although the build was again in local Triassic sandstones and Liassic limestone (Fig. 2) there was a higher proportion of limestone, the blocks of which were laid in courses. Some of the limestone blocks exhibit weathering that has resulted in them looking like rows of round cobbles. On the east gable of the C16th nave are blocks of Liassic limestone containing many fossil shells, while the quoins are cut from a pale oolite-free Jurassic limestone.

The tower at the west end of the church, purportedly built in the C15th, is of a much better quality of build than the rest of the church. The walls, which are around seventy feet high, are built entirely from squared blocks of Liassic limestone laid in courses. The quoins on the tower buttresses, and the bulky plinth around the base of the tower, are large blocks of a pale Jurassic limestone, provisionally identified Dundry Stone, with the same stone used to tie the buttresses into the main body of the tower. This shows that the builders obviously had great confidence in the structural strength of this particular freestone.

After lunch we met at the Church of St Mary Magdalene, Goldcliff, on the other side of the Usk estuary. The church is generally thought to have been built in the C15th after the nearby Priory, which was located near the coast, was badly damaged by a storm and subsequent flooding. However, there is medieval fabric within the building that appears to predate the 1424 flood. Flooding seems to be an ongoing, if infrequent, event as inside the church is a brass plaque that records the flood water level and the loss of life and property after the 'Great Flood' of 1606. The church also received a major 'make over' in the Victorian period and the western tower dates from that period.

Two distinct fabrics were identified, the south and east side of the church are dominated by masonry blocks of pale limestone (Fig. 3). Jana and Andrew provisionally identified these as Dundry Stone and Tim Palmer has confirmed that these are one of the varieties of this lithology. The specific lithology used for the priory requires clarification, but it is most likely that these were recycled from the unstable priory building. On-going work will hopefully clarify this. It is suggested that the Dundry Stone was used to 'up-grade' the existing building, possibly a tithe barn constructed dominantly from local Lias limestone. This is supported by the lack of detail and very austere north wall of the church, which is windlowless and with only a masonry buttress.

Victorian renovation work saw the replacement of the original window dressings with Bath Stone. We have no record of the nature of the stone used for the original medieval dressings. The project members indicated that some medieval window masonry had been present on the site but had unfortunately been stolen.

Figure 3. East elevation of St Mary Magdalene church, Goldcliff showing cut blocks of pale limestone. Photo Graham Oliver.

Conservation and Relocation of a Reredos

In 1925 a new reredos designed by Sir Ninian Comper was installed in St Margaret's church Roath. The original reredos, principally constructed of Penarth alabaster, which was designed by John Pritchard, was moved to St Anne's church in Snipe Street, Roath. Here it was erected in a recess at the west end of the north isle. This area of the church was later partitioned off to form a hall. A photograph of it at this location, taken on June 3rd 2015, appears as Figure 30 on p15 of *Penarth Alabaster* (Statham , 2017). On Christmas Eve 2015 St Anne's church closed and the fate of this work of art hung in the balance. There was a plan to have it erected in St Mary's church Margam Abbey but eventually a place was found for it back in St Margaret's. When it was dismantled it was found that the wall against which it rested was exceedingly damp and large tree roots had grown into the masonry. The damp was actively dissolving the back of the alabaster blocks and had already caused severe damage to some of the inlaid Connemara Marble. It was cleaned and polished and re-erected on a specially designed steel shelf bolted to the north wall of the nave. The stonework was undertaken by Elliot Ryder Conservation of Tregaron and the whole project was achieved at a cost about £10,000.

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