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It seems amazing that a whole year has passed since the first *Newsletter* appeared, and in that time a lot has happened. The Forum has had a highly successful first year and has run a number of well supported field meetings throughout Wales, reports of which occur elsewhere in this newsletter. The Council's thanks go out to those who have organised and led the various meetings.

Membership currently stands at about 60, which is a good start, but there must be many other potential members out there who either may not be aware of the Forum or just haven't got around to joining yet. It needs every one of us to spread the word and entice others into the fold. One problem associated with a small membership is finding enough bodies to fill the roles required to keep the organisation running smoothly. At this stage Council feels that there is a need for someone to take on the role of Meetings Organiser, currently one of the multitude of roles that Tim Palmer is covering. If anybody would be willing to fill such a role would they please contact Tim.

During the summer the Forum presented a poster display at the Sennybridge Agricultural Show. Dyfed Elis Gruffydd fronted the display and he was kept busy answering questions from the many members of the public who showed interest in the presentation. Attending such events is a profitable way to spread the word about the Forum's existence. Hopefully, soon to appear should be a promotional and membership leaflet, an A1 size poster as well as a Forum web site. It is hoped that the latter will serve as a repository for reports on current and completed projects, which will form a useful reference source to all things stone.

### Forthcoming Meetings

The meetings until October 2005 have now been agreed. Full meeting details and further information will be available closer to the dates and also posted on the web site. It is a varied programme that we hope will be of interest to you all.

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| Saturday 26 <sup>th</sup> March | <b><i>The Museum of Welsh Life, St Fagans, Cardiff</i></b><br>11.30am. AGM followed by a talk by Gerallt Nash about stone-built reconstructed buildings and a tour of the site. |
| Saturday 9 <sup>th</sup> April  | <b><i>St David's, Pembrokeshire.</i></b><br>Field meeting. Meeting co-ordinators: John Davies and Judi Loach.<br>Meet at 11.00am at the Cathedral Gatehouse (Porth-y-Twr).      |
| Saturday 7 <sup>th</sup> May    | <b><i>Monmouth, Monmouthshire</i></b><br>Field meeting. Meeting co-ordinator Edward Holland. Start time 11.00am.  |
| Saturday 25 <sup>th</sup> June  | <b><i>Barmouth and Egryn, Gwynedd</i></b><br>Field meeting. Meeting co-ordinator Tim Palmer. Start time 11.00am   |
| September/October               | <b><i>The Carboniferous sandstones of Flintshire</i></b><br>Weekend field meeting based in Wrexham. Meeting co-ordinator Graham Lott. Full details to follow later.             |

## Trefor Granite

The northern skyline of the Lleyn Peninsula in north Wales is punctuated by a series of rugged and steep hills, which are formed from a series of medium-sized granite or, more strictly, granitoid intrusions. There are several, mainly disused quarries scattered around this vicinity but the Trefor granite is still exploited commercially as an ornamental stone.

The Trefor Granite Quarry is located on the north coast of Lleyn about 20 km SSW of Caernarfon, above the small village of Trefor, after which it takes its name. The quarry is accessed (with the permission of the owner) by a steep incline, which rises to a height of almost 150m above the village. It contains about six benches, each approximately 30-50 m high, which face north towards the sea. The total height of the quarry from the top to the bottom is about 300m (1000 feet) and quarrying has removed a considerable chunk of the mountain. Today, much of the quarry is redundant as volumetrically the demand for the stone is very small.

Like the numerous slate quarries, Trefor Quarry is part of the industrial heritage of north Wales. In the early part of the 19th century Samuel Holland, businessman and quarry owner, was heavily involved in the slate mining industry of north Wales. He had also opened up a quarry at Penmaenmawr to provide road surfacing and after some exploration around the granitoid intrusions of the Lleyn, he concluded that the Trefor granite was well suited for producing setts, which were in great demand in the burgeoning cities of the industrial revolution. He opened the quarry in the 1830s to supply this market and as a result a small village grew up at the base of the hill near the pier from which the rock was exported. It was named after Trefor Jones who was Holland's first foreman at the quarry. Extraction of the granite for setts maintained the quarry through much of the 19<sup>th</sup> century but, inevitably as roads became paved with aggregate and tarmacadam, the demand subsequently declined.



Today Trefor Granite is famed for its use for curling stones. Indeed, it was Trefor Granite curling stones that were used in the last winter Olympics in Salt Lake City. The quarry owner, Mr Trevor Davis, insists that Trefor Granite is superior to Eilsa Craig Granite, which was historically the most important rock for making curling stones. It is also used as an ornamental stone for walls, columns, fireplaces etc. The stone is brought down in large blocks from the quarry to the masons' yard at Trefor where it is sliced up using a diamond wire saw and then cut to shape and size on demand in the workshop using cutting machines and stone lathes.

In the geological literature the Trefor Granite is referred to as *The Garnfor Multiple Intrusions*. This indicates that it is composed of several different types of granitoid rock, three types can be identified in the quarry. These are referred to by the quarrymen as pink, blue and grey granite, all of which are used for curling stones. The pink granite forms the core of the intrusion, at least in the higher levels of the quarry, and merges into the grey granite. The blue granite forms the margins of the overall structure and its boundary with the pink is quite sharp.

The granite is probably about 450 million years old and at the time of its formation this part of Wales was a volcanic province with an ocean to the north beyond which was Scotland. The setting was similar to the present day volcanic island chains found around the Pacific such as the Aleutians or Japan, all of which lie above subduction zones. The remnants of these ancient volcanoes and their deposits now form the hard craggy rocks of Snowdonia. Of course not all magma makes it to the surface and that which doesn't, with time, will slowly cool and crystallise producing medium to coarse-grained igneous rocks such as granites. The Trefor Granite and the associated granites that form the prominent hills of the Lleyn are an example of such slow cooling magmas and probably represent the deep roots of the volcanic province that formerly extended west from Snowdonia along the Lleyn Peninsula.

Trefor Granite is no longer in the pristine state it was in when it first crystallized. A subsequent mild metamorphic event resulted in the rock being slightly hydrated. The colours (pink and white) and the opaqueness of the feldspars are a consequence of reactions with hot water which form a veneer of hydrated minerals on the surfaces of the crystals and on the surfaces of micropores within them. The iron magnesium silicates have also been hydrated so that of all the common minerals found in the granite only quartz has remained completely unaltered.

However, although the rock may not take a polish as well as an unaltered granite it has retained its high crushing strength, which is a necessary requirement for curling stones. So, by an accident of its geological history, this unique Welsh rock is now the most sought after material for curling stones in the world.

Dr Charlie Bendall, University of Wales Aberystwyth

## Ferricrete at St Dogmaels

In the summer of 2002, following up ideas hatched at the *Stone in Wales* conference, a number of members of the committee travelled into west and mid Wales seeking out 'exotic' limestone occurring in the fabric of medieval monastic sites. More specifically, we were looking for what might be identified as the "Dundry Stone" of previous records. Was that yellow Jurassic limestone from Bristol really taken in quantity by the Cistercian builders for the finer mason work to counter the rough textures of greywackes and slates of the immediate surroundings of the site? Could there even be French limestones from the Paris Basin sites of the parent communities?

When we reached St Dogmaels, just south of Cardigan, Dyfed Elis Gruffydd was keen to show columns and window tracery of yellow limestone which pose the question, is this Dundry or is it still more 'exotic' and transported from France as it could have been thanks to the coastal setting? Well, the jury is still out on that question, but, if as often happens, when chasing one question another turns up in the process. In the case of St Dogmaels, that diversion was the occurrence in the mixed lithologies of the rubble walling of irregular blocks of highly ferruginous sandstone and sandstone pebble stone. Colours range from a light chestnut-brown to reddish-brown and in extreme cases, a purple tone. In the last instance, the broken surfaces can have a metallic lustre. The grains are coated with the pigmenting iron oxides, creating at the same time the effective cementation of the stone. In my experience of working in the stoneless wastes of the London Basin and nearby regions of poorly consolidated Pleistocene and Tertiary soft rocks, areas occur where iron-rich groundwaters locally cement sands and terrace gravels into what Lamplugh termed ferricrete (1902 Geol Mag). Locally, and in subsurface cuts to create foundationing, these hard lenses provide useful building material in regions of stone poverty. As such, the ferricretes were much used by Saxon and Norman church builders of the period between the 9<sup>th</sup> and 13<sup>th</sup> centuries and would be familiar to the monastic builders of St Dogmaels.



My excitement at the discovery was hardly shared by my companions, (understandably one has to admit), partly because the next question was, where is the local source of ferricrete in west Wales? My lack of knowledge of local geology gave me no chance of answering, although I could and did prophesy that coastal, dune sand or river alluvial sands would have to be examined for a possible source, particularly if there was a trace of yellow 'iron-water' springs. That was how the matter was left when we moved on to Strata Florida and more exciting stonework. One year on, and without much direct application to the question, a breakthrough has come from a new publication from BGS, which offers useful information. The source is one of the new mini-memoirs explaining the geology of Cardigan, Sheet 193 (Davies et al 2003). Not only do these short accounts summarise the kind of detail which used to fill out the full sheet memoir of the past, but also they have a focus upon environmentally important aspects. In this case, there are seven out of twenty five pages devoted to the Quaternary possibly because there is a history of landslipping, with one at St Dogmaels as recently as 1994. These slips result from the thick fluvio-glacial sands and clays, and the deep entrenchment of the Teifi drainage around Cardigan. In describing the deposits, the description of the gravels and sands and the local cementation is described in these terms;

"All the clasts are set in a red ferruginous or, locally, black manganese oxide matrix... They are interpreted as local regolith, scree and alluvial deposits..." (p 14)

As such, the conditions for the formation of ferricrete in other areas are fulfilled quite close to St Dogmaels and the abbey. Plates 7 and 9 on the Memoir offer sight of materials, which are familiar from what we see in the Pleistocene sands and gravels in south-east England when the ferricretes have much of the character of ironpan horizons in the total succession. It would be satisfying to visit the Pantgwyn Mawr Quarry, or sand bluffs in the Teifi valley slopes. But Cardigan is a distant journey from Watchet, and I fear the speed cameras of south Wales, so it remains for Dyfed and local geologists to complete this possible answer to the St Dogmaels riddle.

### References:

Davies, J.R., Waters, R.A., Wilby, P.R., Williams, M. & Wilson, D. 2003, *Geology of the Cardigan and Dinas Island District Sheet 193*, British Geological Survey, pp 1-26  
Lamplugh, G.W.1902, "Calcretes", *Geological Magazine*, 9, p 575

Eric Robinson

## The Old Monnow Bridge, Monmouth

The Monnow Bridge and Gate spans the River Monnow at the southern end of Monmouth. For centuries it has formed the principal access to the town, leading into the main street that climbs up towards Agincourt Square, named after Henry V who was born here in 1387.

The Bridge is generally recorded as having been built in 1272 but there is actually no definite evidence for this. The one thing we can be certain about is that it is the sole surviving example in Britain of a fortified medieval bridge, with a gate-tower set at the entry to the town. Though these were once common fortifications throughout Europe, few now remain. Notable surviving examples are at Cahors (in the Lot region of southern France) and Rothenburg (Bavaria, Germany), to name but two. Bridges, whether fortified or not, are vulnerable to flood damage, often resulting in periodic rebuilding. By the post-Civil War period there was less need to fortify your town against intruders and as travel increased so bridges were widened. Indeed it is remarkable that the Monnow Bridge has evaded destruction by flood and that a single-carriageway entrance to the county town was maintained until 2004.

There is likely to have been a crossing here since the time of the Roman settlement, known as Blestium. A timber bridge is referred to in early 13<sup>th</sup> century documents and, as was typical, this was replaced by a stone bridge towards the end of the 13<sup>th</sup> century. The gate-tower was then added, probably in the early 14<sup>th</sup> century.

The next major change came in the early 18<sup>th</sup> century. In 1705 the then local council ordered "That the present chamblains of ye said Town do forth with cause Monnow Gate and the Gates thereof to be repaired and fitted up". The 'fitting up' referred to the creation of a dwelling for a porter and it became his duty to convert and maintain the structure in return for a nominal rent. Conversion involved rebuilding the battlements, raising the roof and making an extension for a dwelling with a garderobe-style lavatory and fireplace. The timber-framed extension no longer survives, having been demolished in 1815, but it is clearly seen in early 19<sup>th</sup> century watercolours such as that by John Crome, a leading member of the Norwich School of Painters. Views from this period show that pedestrians and vehicles still crossed under the same central arch. By 1819 it had become necessary to address this and, curiously, instead of cutting a pedestrian walkway through the downstream side the Corporation decided



to pierce the upstream side thereby removing the base of the winding stone stairs that gave the gate its rounded end. Meanwhile a new timber staircase was constructed on the other side. This is all clearly recorded in David Cox's etchings of 1827. In 1830 the bridge was widened on the downstream side and pedestrians were able to pass around the tower by means of an over-sailing platform. However, in 1845 it was decided to create a proper pedestrian passage under the gate on this side, with an instruction that the works should not cost more than "Five Pounds".

The bridge today is much as the 1845 alterations left it. There was a major repair programme in 1890's and in 1900 the Duke of Beaufort presented the bridge to Monmouthshire County Council. Throughout the 20<sup>th</sup> century the relentless increase in traffic put the bridge under serious threat. Events such as the extraordinary collision by a double-decker bus, driven by a driver who forgot he was not at the wheel of his usual single-decker, were thankfully rare but little by little the stress on the structure instigated calls for a new bridge. The scars on the gate of scraping by many lorries are all too plain to see and as long as the bridge remained an essential access to the town repairs had to be kept to a minimum and carried out as quickly as possible.

### The materials of the old bridge

The Monnow Bridge is constructed of a number of different types of local stone, mostly from Buckholt. Previous archaeological investigation discovered that the bridge is built directly on the rock without the expected level of foundations.

Dr Michael Rowlands in his book *Monnow Bridge and Gate* lists the stones used as "(1) old red sandstone; (2) a buff-coloured coarse sandstone with occasional pebbles of vein quartz; (3) a micaceous siltstone, greenish grey, with fine laminated bedding, possibly carboniferous; (4) a grey carboniferous limestone, with some fossils; (5) a grey old red sandstone, with no pebbles and no noticeable lamination; (6) a buff-coloured conglomerate, having a coarse sand matrix with bands of fine vein quartz pebbles and a few random larger pebbles; and (7) a sandstone with limonite (ochre) being a variety of type 2". In recent repairs some red Hollington Sandstone from the Triassic of Staffordshire has been used but in forthcoming works the intention is to try and source any stone needed locally.

### The construction of a new bridge

The idea to construct a new bridge was first mooted in the 1920's but it was not until 2004 that a new bridge was finally opened a short way downstream. When the adjacent houses were demolished in 1925 it was seen as an opportunity to rebuild the bridge and in the 1930's there was a scheme to build an extra carriageway abutting the old bridge. Throughout the 20<sup>th</sup> century lack of finance prevented any scheme from being implemented but, by the end of the century, Cadw were increasingly concerned about the continued use of this important Scheduled Ancient Monument as a busy modern road.

Construction, by Costain, finally began in 2003, crossing the river just over 300 metres downstream from the old bridge and entering the town onto the site of the former Cattle Market. The bridge was opened on 15<sup>th</sup> March 2004, combined with the closure of the old bridge, and now a fine view of the old can be had from the new!

### Conservation of the Old Bridge

By means of understanding the structure Monmouthshire County Council commissioned further archaeological investigation of the old bridge in April 2004, following on from work done by Glamorgan Gwent Archaeological Trust in 1988. The latest work was carried out by Archaeolog Cambria and involved the cutting of two sections across the carriageway in the hopes of finding some evidence of what the previous road surface materials had been. Unfortunately no conclusive evidence was found and analysis of 19<sup>th</sup> century illustrations suggests it was a rough metal surface, perhaps laid on teak blocks bedded in lime as was quite common at the time.

The second stage has been for Monmouthshire County Council to commission a Condition Report on the bridge and the gate to inform a programme of repairs that can now progress without pressure to reopen to traffic.

In view of the 19<sup>th</sup> century alterations to the structure we can only attempt to return the character of the bridge to that pre-motorcar era. It would not make sense to attempt a restoration of the medieval bridge when there are clearly post-medieval structural alterations that cannot be undone. The intention is to lay a serviceable surface, such as Cadw use at their guardianship sites, that will be easy for pedestrians, pushchairs and wheelchairs to use but will improve the appearance of the bridge considerably. There is no need to retain the modern black tarmac now that it is not a functioning highway. To carry out this work Monmouthshire County Council has been fortunate to be awarded a substantial grant from Article 33 funding available through the Welsh Development Agency for areas badly affected by Foot and Mouth Disease. This money, principally for the resurfacing, is supplemented by funding from the County Council. Resurfacing of the carriageway and footpaths alone will cost over £150,000, somewhat more than the bill for repairs in 1773 of one pound and sixteen shillings. For the footpaths themselves the modern brick blocks can be removed and stone flagged paths re-laid following the evidence of the old illustrations. These will be combined with stone kerbs.

### Summary

Subject to continued funding a programme of works has now begun that will aim to safeguard the future of this exceptional stone structure and will endeavour to use locally sourced materials wherever possible.

Reference: M L J Rowlands, *Monnow Bridge and Gate* (Alan Sutton, 1994)  
(I am indebted to Dr Rowlands for his help and advice on the history of Monnow Bridge).

Edward Holland, Conservation Officer, Monmouth County Council

## Talgarreg Stone and the Upper Ordovician sandstones of southern Ceredigion



Central block of the stables (c. 1840) at the Allt-y-rodin estate showing the size of the ashlar blocks formerly available from Gwarallt Quarry.

The junction on the geological map between the Ordovician and the Silurian rocks in west Wales undulates in an east-west direction across southern Ceredigion, and across the Teifi into western Carmarthenshire. Northward lies the greywacke country of hard grey Silurian grits, which extends almost as far as the Dyfi. But just south of the line lies a belt of country in which many of the pre 20<sup>th</sup> century houses and farm buildings are built of a brown (sometimes a very pale brown) sandstone. The distinctive character of this tract of land has not been widely recognized from the point of view of the vernacular architecture, but it is distinctive and recognizable once it has been pointed out.



Early 20<sup>th</sup> C. house in Talgarreg (newly cleaned) built with Gwarallt Stone.

The sandstones in question are Late Ordovician in age, belonging to the Ashgill Stage and they are best referred to as the Ashgill Sandstones. Like the Silurian greywackes that followed them geologically, they were deposited on the floor of a sea that deepened in a series of steps from south to north. The steps were defined by geological faults, and the units of sandstone that were exploited for this characteristic local building stone tend to be thickest adjacent to the faults, where the original sand bodies tended to accumulate.

One of the quarries in the Ashgill sandstones is Gwarallt Quarry at Bwlchfadfa in Ceredigion, some 15 km south of Aberaeron and just east of Talgarreg, perched overlooking the Cletwr Valley to the south. In the 19<sup>th</sup> century, this was part of the Allt-y-rodin estate. The stone was used for estate buildings, but attempts were made to market it more widely. The Gwarallt stone is uncharacteristically pale for a Welsh stone, almost a pinkish buff colour, and it is streaked with thin rings of iron staining, which are also present in many of the other varieties of these sandstones seen in the local buildings. It is quite fine-grained and the old buildings show that it could be produced in large blocks suitable for ashlar. The 19<sup>th</sup> century descriptions in local newspapers describe it as being ‘three times stronger than Portland Stone’, but it isn’t clear whether this was a crushing or a bending strength.

Recently permission has been granted to Iwan Evans and Barrie Glenister for this quarry to be reopened, and it is now once more producing hand-dressed and sawn stone for detailing, walling and paving jobs (Phone: 01545-590432). Iwan also runs the adjacent Garden Centre and is enthusiastic and generous with his knowledge about the new stone venture. At the moment only blocks of smaller size are available, but the 19<sup>th</sup> century work at the Allt-y-rodin stable block shows the size of block that were formerly available.



Iwan Evans with new sawn slab from Gwarallt Quarry, near Talgarreg. The pale colour and iron ring staining are typical of the Ashgill Sandstones of south Ceredigion.

### Source and use of Penarth Alabaster

A project is currently being undertaken by Helen Kerbey and Jana Horák (National Museum of Wales) to document the use and exploitation of alabaster from the Triassic strata of south Wales. Bands of gypsum nodules within the Triassic Mercia Mudstone Group are exposed in various places in the Penarth area and any trip along the coast from Penarth to Lavernock Point will find large blocks of the material lying at the foot of the cliffs. So called ‘Penarth Alabaster’ appears to have been extensively used as an ornamental stone in south Wales during the period 1870-1910 yet little documentation exists about its extraction, source and use. To date we have identified thirteen places where named Penarth Alabaster has been used, mostly in south Wales, with another seven candidates yet to be examined. The majority of these are in late 19<sup>th</sup> – early 20<sup>th</sup> century churches, which were built according to the designs of the Llandaff Diocesan architect John Prichard and with the majority of the carving work undertaken by William Clarke.

The extent of alabaster use in the churches varies from simple panels set into pulpits made of Quarella or similar sandstone, to more extensive use in walling where it is juxtaposed



with stones of contrasting colour, typically green or cream Quarella Sandstone and red Forest of Dean Sandstone. The most intensive exploitation is seen at St Margaret’s in Roath, Cardiff, where it has been used for columns, the reredos, walls and the pulpit. Here the blocks vary in size with the largest recorded being 56cm (w) x 32 cm (d) x 24.5 cm (h) and the largest column stones 50cm in diameter and 26cm high.

Location	Use	Date of working	Architect(A) / Mason (M)
St Margaret of Antioch, Roath, Cardiff	Bricks and ornamental	1870	John Prichard (A) William Clarke (M)
St Catharines Church, Baglan	Bricks and ornamental	1875	John Prichard (A)
All Saints Church, Pen-y-Fai	Reredos	1900	John Jones (A) William Clarke (M)
St John the Baptist, Llanblethian, Cowbridge	Pulpit	1896	restored CB Fowler (A) William Clarke (M)
St Bridget Church, St Brides-super-Ely	Memorial	?	?
Insole Court, Llandaff, Cardiff	Archways, balustrade	1880	Edwin Seward (A) William Clarke (M)
All Saints Church, Pontardawe	Gables	1885	John Griffiths & A. Gilbertson (A) W. Clarke (M)
St Martins Church, Cardiff Rd, Caerphilly	Gables	1902	GE Halliday (A/M?)
St Davids Church, Gyfelliwion, Hopkinstown, Pontypridd	Pulpit	1914	GE Halliday (A/M?)
University College, Cardiff	Tiles	1903	WD Caroë (A)
Empire Theatre, Queen Street, Cardiff	Tiles		?
St Stephen’s Church, Westminster	Memorial	1902	?
Georgian Villa at Penrice Castle, Penrice estate, Oxwich	Plaster for walls	1870?	?

Table 1. Named uses of Penarth Alabaster. Note: the Empire Theatre is now destroyed

### Extraction

North (1916) noted that alabaster for the ‘Main Building’ of what is now Cardiff University was derived from Lavernock. However attempts to locate the level shown in the BGS memoir (Strahan & Cantrill, 1902) in June 2004 failed to find any traces at this locality. The source of the alabaster is puzzling as the quality of the material along the Penarth - Lavernock coastline appears poor with the bands being ‘boudinaged’ and less than a foot thick. The pinkest material occurs at Penarth Head and is much more interspersed with green mudstone veins than that at Lavernock which is also more uniform in composition and very white. To obtain the tiles and blocks seen in some of the buildings large quantities of the material would have needed to be processed. Our own laboratory attempts to prepare a tile have shown how easily it breaks along veins and fractures into smaller pieces.

Although we have found reference in the literature to three localities where alabaster may have been obtained, as yet no definitive extraction point or information on who may have worked it have been identified. At the time when the alabaster was being used as an ornamental stone the land around Penarth appears to have been under the ownership of Lord Windsor. Earlier mentions of the use and trade in Penarth Alabaster from the beach exist but this appears to be for use as a source of plaster. Accounts at the Glamorgan Record Office show that between 1840 and 1860 it was sold from the beach at Penarth for a time by Henry Withers on behalf of the Baroness Windsor.

Location	Details	References
Coastline between Lavernock and Penarth, South east of Cog, 1.5 km inland from Lavernock	A former 'level' is marked in cross section in Strahan & Cantrill (1902) p61 Gypsum was worked in the Triassic marls SE of Cog from a quarry about 1.5 km inland from Lavernock. It now looks like it is filled in and is grassed over.	Strahan & Cantrill (1902) North (1916) p26 North, F.J. (1916)p26, Cox, A.H (1937).p23
Earl of Bute's Estate at Llandough	In 1803 alabaster, fuller's earth and black marble workings provided employment for many local people.	Malkin, B.H.(1804) Vol 1, p209
Penarth Head ?	Large veins, of very pink material	Field observation
Penarth, west of the pier ?	The land is cut back to the south of the pier suggesting possible former extraction? Recent assessment suggests that the gypsum beds probably do not outcrop at this level.	? local information

**Table 2.** List of possible localities for extraction

To further our work we would be grateful for any information on the use of Penarth Alabaster. In particular documentation relating to extraction would be of great interest.

#### References

- North, F.J. 1917. The Minerals of Glamorgan. *Transactions Cardiff Naturalists' Society*, **49** (for 1916), 16-51  
Cox, A.H. 1937. The natural resources of the South Wales industrial region. *Proof for the Second Industrial Survey of South Wales to be published in 1937*  
Strahan, A. & Cantrill, T.C. 1902. The Geology of the South Wales Coalfield, Pt III, The Country around Cardiff. *Memoirs of the Geological Survey of England and Wales*  
Malkin, B.H. (1804) *Scenery & Antiquities of Wales*

Jana Horák and Helen Kerbey, National Museums & Galleries of Wales

### Salt-induced decay on westerly coasts

The problem of salt-driven decay of soft sandstones has received a lot of attention from both conservators and academics, and naturally we talked about it during the tour of Aberystwyth's stone buildings following the AGM in March. The Old College and the adjacent St Michael's Church show some badly affected areas where the individual grains within lightly cemented sandstones have been prized apart by salt crystal growth during drying by evaporation at the surface of the stone. At Aberystwyth, high winter seas during storms will send spume over the tops of five-storey buildings and exposed exterior walls will become thoroughly saturated with sea-water. Clearly this is a problem all along the west and south-west coastlines of Britain, and Robin Sheldrake has sent us a picture of a good (or should that be bad?) example from Nolton Haven in Pembrokeshire. The old Congregational chapel (SM 860 185) is built of the local Upper Carboniferous sandstones and shows severe decay, probably exacerbated by re-pointing with a hard cement-based mortar.



But a noticeable point in many of these cases (including Robin's example) is that the worst of the decay is on the leeward side of the building, where it might be expected that there would be some shelter from the prevailing winds. What we may in fact be seeing is the interaction of storms and normal rain, of which west Wales has no shortage. When gales are blowing strongly and whipping up the sea spray, the winds eddy around exposed buildings and coat both windward and leeward sides with salt water, which soaks into porous stonework. But when rain comes in from the prevailing direction under less stormy conditions, it predominantly covers just the exposed windward

face of the structure, and helps to wash out much of the salt from this side. Thus decay is a compromise between saltwater saturation and freshwater flushing, with the most serious effects being seen on the side that gets less wet under normal rain conditions.

The pillars that flank the main doorway of the National Library of Wales in Aberystwyth appear to show a mild version of this phenomenon as well, and they are built of Portland Stone. They are a good half mile from the sea, but exposed on the hillside above the town. Maybe this decay mechanism can operate for some distance inland in exposed situations. Does anyone have other good examples of this sort of decay?

Tim Palmer, University of Aberystwyth

## FIELD MEETING REPORTS

### Aberystwyth Field Meeting: 27th March 2004

On a cold Saturday about 20 people attended the Forum AGM at the Old College in Aberystwyth followed by a field visit to various buildings in the town with Dr Tim Palmer and Ian Thomas.

The main local building stone comes from the grey, impure sandstone/mudstone sequences of the Aberystwyth Grits Formation (known as greywackes). However, many other local and non-local stones have been used around the town. The first stop was the outside of the Old College itself which was built in a series of different stages resulting in the use of a variety of different stones.

Originally designed in the 1860's, the Old College is one of the top examples of Victorian Gothic buildings in Wales. It started out as extensions built on to John Nash's late 18<sup>th</sup> century triangular Gothic folly 'Castle House' and was originally designed as a sea-front hotel by Thomas Savin. He began to add wings to the north and south but went bankrupt in 1866 before he was able to complete the expensive task. At this stage it was bought by the University College of Wales who appointed the architect John Pollard Seddon to complete and adapt the building for teaching purposes.

The oldest part of the college was built of blocks of yellow Cefn Sandstone with Bath Stone dressings. Cefn Sandstone is from the Upper Carboniferous of the Wrexham area and was used in many constructions because of its high quartz content and thus high strength. A famous example of its use was by Thomas Telford for the Pontcysyllte Aqueduct. The windows of the Old College were fronted by (now heavily weathered) pillars of blue Hanham Blue Sandstone, from the Upper Carboniferous of Bristol, with white capitals of Magnesian Limestone and Portland Stone, and bases of white Portland Stone. The pale oolitic Bath Stone used in the dressings around the windows and doors came from the famous Box quarries near Corsham in Wiltshire.



When Seddon completed the building, some twenty years later, funding was a problem and despite raising much of the required funds the top part of the north-west elevation had to be completed with Doulling Stone from north Somerset and concrete blockwork. The line between the earlier work and the later, cheaper, materials was just visible from ground level by the field party. Finally, in the 1890's, Nash's Castle House was pulled down and the large central block was built using yet another building stone; pale Triassic Grinshill Sandstone from Shropshire. This stone can often be identified by its characteristic quartz

veining (Fig 1), little evident sedimentary lamination and occasional small holes where mud flakes have weathered out. This is a very good freestone and has been used throughout this section, including mouldings and carvings around the windows and doorways.

Before leaving the college we toured the main staircase inside where we searched for Ransome's Artificial Stone. This is recorded as having been used by Seddon who was a great admirer of the silicate-cemented artificial sandstone but we decided it was probably used for the ornate mouldings which were just out of reach for close examination, but certainly appeared to resemble real stone very well. According to the literature<sup>1</sup> Ransome's materials were made from a concoction of quartz sand, limestone, calcium chloride, flint, quartz, and caustic soda and "...distinguish themselves by the sharpness of their forms, equal colour, resistance to heat, frost, dirty water, all atmospheric influences, and, finally and chiefly, by their cheapness". His products were very popular in London in the late 1800's and were produced in a factory in East Greenwich.

After examining all of the different stone characteristics we walked up the hill to the ruins of the late 13th century castle. The majority of the building stone was the local Aberystwyth Grit however there were a few exotics hidden amongst the structures. The cross-slit windows high in the walls appeared to be bordered by a yellow,



Fig 2

probably Jurassic limestone whilst amongst the rest of the ruins, particularly around doorways, were found blocks of Dundry Stone (recognisable by their lack of oolites), possible sandstones from Anglesey and a purple sandstone reminiscent of Cambrian Caerbwdi Sandstone from Pembrokeshire. In places some wonderful flute structures on the under surfaces of slabs of Aberystwyth Grit had clearly been used as decorations in seating areas.

Next on the tour was the nearby St Michael's Church. This building, like the previous two, is very exposed to the sea and the orange sandstone blocks primarily used in its construction are heavily weathered. The main stone is probably again the Carboniferous Cefn Sandstone though many different repairs have taken place with Jurassic limestones and other sandstones that a hotchpotch mixture of colours and lithologies now occur around the windows and doors (Fig 2).

Next we moved on to the Natwest bank which has been completely constructed from large, ashlar blocks of an orangey sandstone; the same material being used for the window frames and an ornate balustrade on the roof. It is thought that this is probably also Cefn Sandstone, but it has not weathered to the same degree as the buildings nearer the coastline. The blocks show very clear bedding structures and there is also a blotchy darker coating in places suggesting that the stones have been treated in some way on the exterior.

Further on we were shown an interesting late 19th century chapel built from a striking blue rock (Fig 3) with pink granite decorative pillars of an unknown source. The blue rock, Tim explained, was called Llanddewi Brefi Bluestone and is a very strong, coarse, Silurian greywacke from Llanddewi-Brefi, near Lampeter. The style of work here is called jumper work (sometimes also called snecking) as some of the blocks rise more than one course. Though used for the bluestone here, it is also the normal pattern for Cardiganshire buildings built with greywackes from the mid 19th to the early 20th century.



Fig 3

The tour was completed with a trip to the library (erected 1903). This stood out from a distance as it was composed of grey Aberystwyth greywackes with quoins and window frames of bright red Triassic sandstone that has weathered badly in the salty air. The building stones of Aberystwyth had proved to be very eclectic and the field visit was enjoyed by all.

#### Reference

"Ransome's Artificial Stone" *Manufacturer and builder* 1870 Vol 2 (6) p163

## SHORT NEWS ITEMS

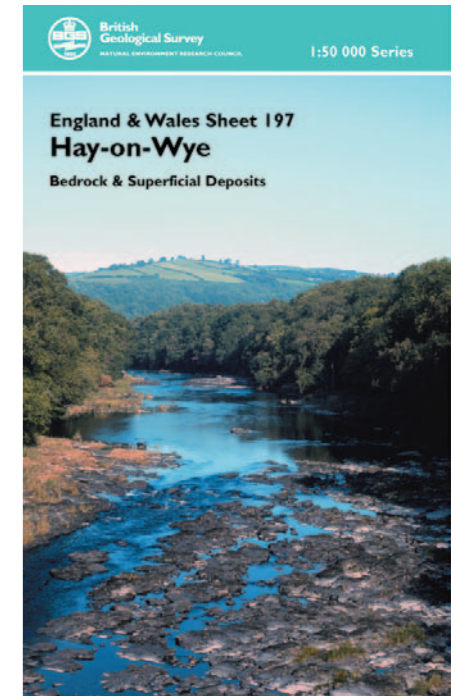
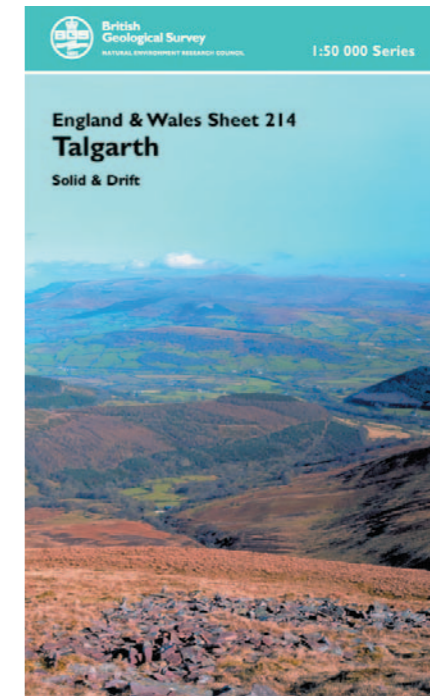
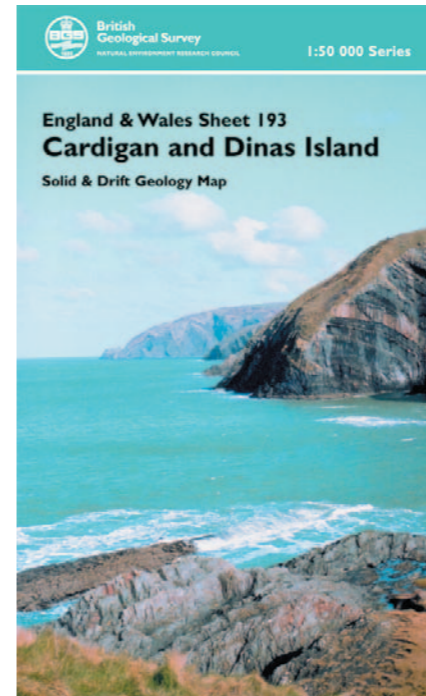
### Welsh Stone Conference volume

The conference volume is in the final throes of proofing and is now nearing completion. Hopefully it should be published shortly and will be dropping through your letterbox if you were a registrant at the conference. Our thanks go out to Malcolm Coulsen for his sterling efforts in seeing this project through to completion and to CADW for funding the publication.

### Current BGS activity in Wales

This year saw the roll out of a major new programme the **GeoCYMRU** initiative which ultimately aims to provide up-to-date geological information in the form of a national geoscience knowledge base for Wales. This information will be used to underpin the decision-making process, with regard to planning and developmental issues, by the provision of essential layers of geological information for both local and national government and the wider user community such as environmental bodies, land owners, utility companies, national parks and the conservation and minerals sectors.

The first priority of **GeoCYMRU** (designated *Phase 1 - Central Wales Rapid Mapping*) was to accelerate the current mapping programme by providing additional resources and by the introduction of new and innovative technologies. The objective of Phase 1 is to complete the outstanding baseline geological coverage in Wales over an area, which equates to some 20% of the national territory. It is planned that *Phase 1* will be completed over a four-



year period but the absolute time frame will to some extent depend upon the availability of additional external co-funding support over and above that which is currently provided by the Welsh Assembly Government.

During 2004 the field survey of the Llangranog and Newcastle Emlyn 1:50,000 map sheets was successfully completed and 'first draft' digital geological linework for these areas should be available early in the new year. The 2004 field season involved 12 BGS mapping professionals. Additional inputs to the mapping effort were also provided in geochemistry and geophysics and importantly from a team of biostratigraphers that included specialists from both the BGS and the National Museum & Galleries of Wales. Given the ambitious objectives of the *Phase 1* programme plans for the 2005 field season which will focus on the Llandovery and Fishguard map sheets are already in hand. A partial revision of the Cardiff map is also underway.

Dr John Aspden (Project Manager), British Geological Survey.

### Welsh Stone Forum – archiving publications

The Department of Geology, National Museum of Wales is willing to receive and archive papers, publications and booklets relating to the use and occurrence of stone in Wales on behalf of the Welsh Stone Forum. If you wish to donate any such publications, please contact Jana Horák (029 20573353 [jana.horak@nmgw.ac.uk](mailto:jana.horak@nmgw.ac.uk)) or Helen Kerbey (029 2057367 [helen.kerbey@nmgw.ac.uk](mailto:helen.kerbey@nmgw.ac.uk)) in the Mineralogy & Petrology Section.

### Plastic stones for the Gorsedd?

Members may well have read the comments in then Press, from the National Eisteddfod organisers, that they may cease to continue the tradition of erecting a Gorsedd Circle of local stone at each venue. Instead, they may change to a light-weight, easily movable alternative in years to come. Such a proclamation led Eric Robinson to put pen to paper to the Bard, Eldred Roberts, in defence of the true Gorsedd Circle, the text of which follows.

'For the past two years, I have regarded it a privilege as an Englishman to belong to the Welsh Stone Forum simply because, following a rousing meeting in Cardiff, the Forum urged the use of Welsh stone for buildings in the Welsh countryside. This bold stand was endorsed immediately by the Welsh Assembly. We have never achieved a similar resolve in England!

This said, I was dismayed to learn that in future, Gorsedd Circles, a significant statement of an Eisteddfod, might in years to come be a kind of moveable furniture made from materials other than stone.

There can't be any corner of Wales which could not provide a truly "local Distinctiveness" for the meeting which would always be the epitome of Welsh craftsmanship and culture. Sticking to what has been a tradition would be a great fillip to Welsh quarrymen and their masoncraft. This is surely something which needs to be kept

in mind? England is watching!’

Your Council is also petitioning against the use of plastic stones and the response to both our letters is awaited with interest.

### Future Monmouthshire Antiquary publication

Members may be interested to know about the following paper, that is being published in the *Monmouthshire Antiquary*, early in 2005: Allen, J.R.L., “Roman and medieval-early modern building stones in Southeast Wales: the Sudbrook sandstone and Dolomitic Conglomerate (Triassic)”.

Professor Allen writes: ‘It is the aim of this paper to review the geological characteristics of the Dolomitic Conglomerate and Sudbrook Sandstone, and to establish the distribution and use of these versatile rocks as building materials in the coastal area between the Usk and the Wye. The Sudbrook Sandstone and the finer facies of the Dolomitic Conglomerate were especially favoured as a freestone for quoins and dressings, but were also used in dressed or rubble form for general walling. The Sudbrook Sandstone was procured for the chief Roman settlements, but not the Dolomitic Conglomerate. Together with the Dolomitic Conglomerate, the sandstone was used again in medieval and early-modern times beginning with the Norman conquest. The earliest Norman application of the Sudbrook Sandstone, at Chepstow Castle (Great Tower), appears to have included if not relied entirely upon, the robbing of Roman buildings. This paper is not the first to record the use of comparatively local, early Triassic sandstone for building in the area (churches and castles especially), but systematic geological attributions and an analysis of exploitation have not previously been attempted. This kind of approach can shed light on past economies and the changing influence of expediency, taste and fashion on the choice of building materials. Moreover, the successful conservation or restoration of an historic building calls for an accurate knowledge of its construction materials and their provenance.’

Tim Palmer, University of Aberystwyth.

### Building hazards in the USA

During a recent visit to the USA I was reminded forcibly of the hazards which American architects and civil engineers have to face on a daily basis when designing and constructing buildings. The use of local materials for construction has to be mindful of the natural phenomena which can seriously jeopardise the integrity of buildings, including both above-ground forces such as hurricanes and tornados as well as the below-ground violent episodes associated with earth movements.

The two examples illustrated here demonstrate two of the effects:- Firstly the results of serious p-wave vibrations in the highly active area around the town of Branson in SW Missouri (Fig 1) where local magnesian limestones from the Lower Mississippian have been found wanting in structural integrity.



Fig 1



Fig 2

Secondly, this decoy duplicate of the White House was built directly over the Ogalala thrust zone in central Wisconsin (Fig 2) with the alarming results that are evident.

We in the UK should learn from the USA that whilst these mistakes do little for architect/client relationships, they work wonders for the tourist industry.

Y'all have a nice day

Naylor Firth