Rep. Trans. Devon. Ass. Advmt Sci. **III**, 165–170

Church Geology

By *R. Hansford Worth*, *M.Inst.C.E., F.G.S.* (*1868–1950*)

Edited by *E. N. Masson Phillips*, *F.S.A.*

Chestnut Cottage, Maudlin Road, Totnes

'Church Geology' was the title of a lecture given to the Plymouth and District Branch of the Devonshire Association in February, 1945. Some years ago a copy of the original script came into my possession and, in view of its great interest, I have edited it for publication. Although he never prepared the paper for this purpose himself, I am sure that my old friend, Richard Hansford Worth, would have consented to this being done. (E.N.M.P.)

THE stone most frequently used in local churches is perhaps granite and this was also the material from which were cut the vast majority of the stone crosses of Devon and Cornwall. The early use of granite was restricted to surface blocks of 'moorstone' and it was not until the early nineteenth century that granite quarrying became general practice. Even as late as 1849 a Cornishman could write: 'surface blocks are specially coveted, not only because they are more durable than the quarried material, but also because they are cheaper.' In earlier work the piers of church arcades were mainly masonry in relatively small blocks but by the time the Perpendicular style prevailed the taste was for monoliths and the available surface blocks of moorstone provided suitable material.

An interesting variety was the St. Stephens stone, really a china-stone, or in other words a partly kaolinised granite; the fine tower of Probus church is built from this material. It will be remembered also that Cookworthy first came to a knowledge of china-stone from the use of this material, brought from Tregonning Hill, in the casemates of Plymouth Citadel.

The dykes of granitoid rock, commonly known as elvans, can hardly be separated in such a list as this from the granites proper, although very different in grain from most granites.

Roborough stone is a good example; it occurs as a dyke on Roborough Down, extending from near Clearbrook almost to Milton Combe. It has been raised on Roborough Down from a series of relatively shallow trenches [1], but it must formerly have occurred in some quantity as surface blocks, many of the smaller of which still remain. Its chief use was in tracery, arches and door jambs, but it was used not only in churches and such furniture of churches as stoups and fonts,[2] but also in

domestic architecture and domestic utensils such as querns, mortars and troughs. There is a trough at Old Yelverton, in this stone, 4 ft 9 in. long, 2 ft 3 in. wide and almost 2 ft 0 in. in height, while the quern at Goodameavy House is 1 ft 10 in. in diameter by 9 in. high. The trough, which is well wrought and strictly rectangular, obviously needed a fairly large parent block, and larger blocks still were needed for such work as the dressings of the west door at Sheepstor church, or at Shaugh Prior, the latter unfortunately repaired in granite. It is difficult to believe that either as to size or quantity the workings now traceable on Roborough Down ever yielded the whole or even a great part of the material to be found in our churches. There must, I think, have been a great scouring of the Down for surface stone. The following extract from the will of Richard Strode, 1464, is of interest: 'I will that my heirs or executors make a new window in Rowburghstone in the Guild of St. Katerine in the north and east part of the angle of the altar (of St. Mary's Church, Plympton) in honour of St. Sativole.' The window still exists. Again, in 1495, proceedings were instituted against some Plymouth merchants for having broken into the premises of Sir John Crocker at Rouburghe and taken from his quarries there stones to the value of 40 marks. The honeycombed appearance of Roborough stone has led some modern architects to look upon it with suspicion, but in fact it has remarkable qualities of resisting erosion. I think that the Shillamill–Morwellham felsites also found some use in church building.

In Cornwall several elvans were also freely used; perhaps the most important was that from Pentewan near St. Austell. The church tower of St. Austell is a fine example of the capabilities of this stone, while near at hand to us we can see it in domestic architecture at Antony House, near Torpoint. It is perhaps surprising that the medieval craftsmen made no special use of the ornamental varieties of granite such as the tourmaline-granites, some of which closely resemble the black and red Cornish Luxulyanite which was used for the Duke of Wellington's sarcophagus in Westminster Abbey.[3]

Next in order of the igneous rocks we may perhaps take the traps and porphyries of the Exeter Volcanic series (Permian) so prominent in the church buildings of Exeter, and also in the cincture of the walled city. For the more part these have proved durable and kindly working. As much cannot be said for the sandstones and conglomerates of the New Red rocks although they vary considerably in lasting quality and at times leave little to be desired. The sandstones of this series found little use except in their own district but I have seen blocks in the ruined foundations of Plympton Priory. The Torbay area seems to have been the source of the New Red (Permian) sandstone and conglomerate used in south Devon. Thus the churches of Paignton and Totnes and the walls and tower of the bishop's residence at Paignton were all constructed

from these materials, derived no doubt from one of the medieval quarries in the vicinity. As early as the twelfth century the canons of Torre Abbey were removing stone from Corbyn's Head.

The dark hornblendic traps of Catacleuse in Constantine would impress one as being a somewhat improbable material to find among our western building stones for use in tracery and dressings and yet it was freely used in Cornwall, works well and has proved fully as enduring as its composition would suggest. A trap which was used in the buttresses of St. Andrew's church, Plymouth, has not generally been recognized. It has not weathered really well where it occurs in conjunction with limestone in the quoins.

It is interesting since the church stands at the junction of the limestone and a dyke of Spilite (Worth, R. H., 1916) which formerly appeared above surface in Basket street and, passing under Bedford street, died away in contact with slate on the site of the Prudential Buildings. These features no longer exist but the dyke still lies under Royal Parade to the north of St Andrew's church and the Guildhall. The walling stone of St. Andrew's may have been quarried almost on the spot, the limestone rather to the south, the trap to the north. Another igneous rock has been freely used in our neighbourhood, especially in Tavistock and its vicinity, although it travelled far from its quarry at times. This is the volcanic ash from Hurdwick. It has some of the apparent weakness of Roborough stone, a deceptive open texture which simulates decay, but in use it has proved enduring beyond all ordinary standards and from a selected compact specimen I have seen a Neolithic axe, hard and with a good cutting edge. This came from the collection of the late Mr. Cowling, of Brent Tor. The Hurdwick stone was largely used in tracery and I have seen it among the ruins of Plympton Priory. It was also largely used in walling.

The serpentinous Polyphant stone from the Launceston area was very freeworking and at its best a good and reliable stone. It may be seen in the doorway of the White Hart at Launceston, to which site it was removed from the ruins of the Priory. It is less used for tracery than for arches, jambs and quoins, also at times for columns of small diameter. The rock is best described as a Picrite, the Olivine being changed to serpentine with much iron present.

Of the sedimentary rocks I suppose one should first mention to a Plymouth audience the Devonian limestone, so extensively quarried in the past as in the present and so freely used in churches and other buildings, mainly if not exclusively for walling. It affords a good example of the tendency to use local material for walling stone in all but the most important of buildings. It is never found in early work far from the quarries which range from Torquay to Plymouth. The fault is the fine, almost invisible jointing which traverses even compact-looking

blocks and conducts the rain well into or even through the wall. As a marble it is fairly enduring against weathering and chemical attack except by acid waters. Indeed it may be described as excellent in this respect, the chief result of weathering being a superficial etching which brings into relief the coral structure. Especially is this well-marked at Cattedown where the chemical works have supplied acid fumes. The decorative possibilities of the south Devon marble have been little exploited in its homeland, but were magnificently used in the Brompton Oratory.

Quite a different marble was imported in relatively small quantities from Purbeck. It is a limestone which consists essentially of a mass of shells and is a member of the Upper Jurassic system, the fossil shells being the freshwater *Paludina*. This was largely used in monumental work, but less in west Devon and Cornwall than elsewhere in southern England. There is an effigy in Purbeck marble still to be seen in the porch of St. Andrew's, Plymouth and I found fragments of columns of small diameter on the site of Plympton Priory.

The limestone from Beer in south-east Devon is a very restricted phase of the Middle Chalk. Its strata being practically horizontal, and overlaid by a considerable depth of chalk, the only practical method of raising this stone has been by underground workings, and these are of very considerable extent. It is very free-working, especially while the quarry water is still in it, but hardens on drying. In early work it was used by the Romans and keenly exploited by the Normans for interior church work and much of it has been mistaken for Caen stone from Normandy, which is an oolite. Although ill-adapted for exterior work it permits great delicacy of detail in interiors and in monumental use. Much of this stone may be seen in Exeter cathedral, and in greater or less quantity it has found use throughout Devon.[4] At Sheepstor, I was of the opinion that the sculpture over the door of the south porch was in Beer stone, a mistake easily comprehensible where a glazed door prevented access to the carving and the surface grain was all that was ascertainable, but I have since been able to open the glazed panel and to examine the carving. I found that the rather minutely-granular appearance was merely a surface underlain by hard unweathered stone. The material is, in fact, that form of marble which is commonly called oriental alabaster, the same stone which appears in the fragment of a monument to the wife of one of the Elfords, on the north wall of the interior of the church. While the protection afforded by the glazed panel is to be approved it is not essential, the carved work would still survive for many years under full exposure to the weather, but oriental alabaster is nowhere used structurally as far as I am aware.

Another limestone, from Ham Hill, finds fairly free use just over the eastern boundary of our county. The outstanding example is Ford

Abbey where an arcading in the cloisters reveals that the stone was brought into use late in the history of the abbey. The whole of this arcading is literally veneered over much earlier work. The earlier work is sound and might well have stood unobscured, but fashion had changed and the monks had no respect for antiquity so the transitional Early English arcade was relegated to the background of oblivion and was only rediscovered when repairs became necessary to the screen which hid it. Ham Hill stone is a local form of inferior Oolite age and is not wholly reliable. At its best it is good—at its worst it can be bad indeed. It was used in window dressings in brick buildings south of the library in Tavistock road, Plymouth, and some of the mullions of those windows have crashed on the pavement.

The imported stone which found greatest favour was an oolitic limestone from Caen in Normandy. The general appearance is not unlike Beer stone but the detailed structure is very different. Caen stone was used alike in interior and exterior work.

I have already mentioned the sandstone of the New Red beds, free working and, at its best, fairly fitted for exposure. It is now represented in many localities by the fonts alone; fonts which are often legacies from earlier buildings on the same sites. Thus it has been suggested that Permain red sandstone from Roundham, Paignton, was used for the series of similar Norman fonts, bearing palmetto ornament, found in twelve churches in south Devon.[5]

A sandstone which has found a rather severely localised use occurs as a bed in the Carboniferous strata at Cleave, one and two third miles south-west of Hatherleigh church. The bed ranges east and west for a distance of about half a mile. It lies at a very steep dip and has been worked in a number of small quarries, rather like trenches. It has found use in the local churches but the best known examples of its use are at Okehampton Castle and the pocket edition of a castle at Gidleigh, while again at Okehampton a relatively recent building in this stone is Oaklands House. The rock is a sandstone with a cement of carbonate of magnesium and, like most magnesiun sandstones, is enduring. At Okehampton and Gidleigh castles it still bears the tool-marks of its original shaping; the weather has but stained it purple-brown. At Gidleigh it was used not only for the dressings of windows and doors but also for the newel of the staircase, but the main part of the treads were formed in granite as better fitted to take mechanical wear.

In conclusion it must be admitted that there are a number of puzzles that await solution, for example the stone which was used in the northern pier of the chancel arch at Meavy and the fine-grained granitic rock found in the masonry piers at Ugborough. Some at least of these unidentified rocks are very probably felsites, but they will remain un-identified until sufficiently large chips can be secured to enable

microscopic diagnosis. One hesitates to seek to obtain even a small piece, and yet restorers have little compunction about redressing old work. Occasionally a single mineral in a rock may give detailed information. For instance it is known that the granite of the cross-head in the porch of Ermington church came from the Erme valley since Pinite is a sufficiently prominent mineral in the stone, and the Erme valley is the one Dartmoor source of pinitic granite, which is now known to occur from Ivybridge on the south to Hook Lake on the north, and from Ludbrook on the east to Redaven Gulf on the west thus slightly overlapping the valley to the west and more markedly on the east. It is interesting also that the type of the Ermington cross is identical with that of Spurrel's Cross (also cut from pinitic granite) on the eastern verge of the Erme watershed.

Notes

1. At approximately SX 515655.
2. For example the fonts at Bickleigh and Plympton St. Mary, and the cross-shaft at Plympton St. Maurice.
3. One such altered granite, known only from a single surface block (not *in situ*) was named Trowlesworthite by R. N. Worth (*Rep. Trans. Devon. Ass. Advmt Sci.*, **16**, 72–74, 1884). It differs in composition from the normal red granite of the Trowlesworthy tors since it consists of red felspar, black tourmaline and purple fluor.
4. For example the chancel screen at Totnes and the Saxon cross at Colyton, together with many fonts and tombs, etc.
5. At Ashprington, Blackawton, Buckfastleigh, Cornworthy, Dartmouth (St. Petrox), Denbury, Paignton, Plymstock, South Brent, Thurlestone, Ugborough, and Wolborough.

Reference

Worth, R. H., 1916. The Dunstones of Plymouth and the Compton-Efford Grit. *Rep. Trans. Devon. Ass. Advmt Sci.*, **48**, 217–259.