

7.1.12 Geology of Stone used for sculpture and building

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Method

A project designed to identify the type and sources of stone used in carving and building at Portmahomack was undertaken from 1998, and included the following tasks:

- (a) Examination of carved stones held in the collection of the National Museum of Scotland at their workshop in Granton, Edinburgh (NMS);
- (b) The collection of a representative sandstone collection from quarries and exposures in the Tarbat peninsula;
- (c) Literature search for former quarry sites and geological notes pertaining to the project;
- (d) Brief examination of the sandstones used in Tarbat Old Church;
- (e) The establishment of a database of magnetic susceptibility readings from geological samples and carved stones;
- (f) The establishment of a database of published geological data on carved stones.

The local geology

Portmahomack lies almost at the centre of an arc of sandstones that extend from the south shores of the Moray Firth, across the Black Isle and northwards in a thin coastal strip of sandstone towards Helmsdale where a mass of granite (*c.*420 Ma) emplaced during the late phase of the Caledonides separates the strip from the extensive Old Red Sandstones of Caithness. The ages of these sandstones vary from Devonian (Old Red Sandstone) (410-360 Ma) centred on the Black Isle and Tarbat peninsula to Triassic (250 - 200 Ma) between Burghhead and Lossiemouth, and Jurassic (200-140 Ma) around Golspie.

The Tarbat peninsula, apart from the hill of North Sutor, is composed of Devonian sandstones belonging to the Old Red Sandstone Supergroup. The coastal strip from Tain eastwards towards Portmahomack and Tarbat Ness is comprised of Upper Old Red Sandstones of the Balnagown Group (UORS), whilst sandstones exposed along the coast from a little south of Shandwick and extending northwards along the southern coast of the peninsula to Wilkhaven are comprised of Middle Old Red Sandstones of the Strath Rory Group (MORS). The base of the UORS is conjectural, but is thought to run on a line from Nigg Bay to Hill of Fearn and then north east to Pitkerrie, Meikle Tarrel and on the coast at Wilkhaven. Middle

and Upper Jurassic sediments of clayey siltstone, sandy siltstone interbedded with calcareous siltstone, and coarse, poorly fossiliferous bituminous siltstone are exposed on the foreshore south of Balintore. Drift deposits of either boulder clay, or, nearer the coast, of raised beach deposits, limit rock outcrop to the coastal section. The Moinian psammitic granulite of the North Sutor comprises the largest inland exposure of rock.

Quarries are generally limited to coastal areas or places where the drift deposits are shallow as in the Lower Pitkerrie area. Today there are no working quarries, but around a dozen quarries are known to have been in existence since the 18th century.

Stone used for Pictish sculpture

Only one of the stones from the group so far recovered at Tarbat can be said with some degree of certainty to come from the exposures in the immediate neighbourhood of Portmahomack; this is TR28, the "Calf" stone.

A group of stones, defined by the presence of iron blebs or of Liesegang rings, include the finest of the Tarbat sculptures (TR1, TR10 and TR20), as well as the other monumental stones sited elsewhere on the Tarbat peninsula: Nigg, Shandwick and Hilton of Cadboll (this also applies to the additional flaked fragments recovered at the Hilton chapel in 1998). On this basis, the petrological verdict is that TR10 (the inscription) and TR20 (the Apostle Stone) could have come from the same geological formation. However, TR2 (and TR7) do not match TR10 and TR20 geologically and thus are unlikely to have formed part of the same monument. No rock exposures examined so far on the Tarbat peninsula showed the presence either of the iron blebs or the Liesegang rings, so the source for the major Tarbat monuments is as yet unidentified and may lie beyond the peninsula (Note: they have since been found by sculptor Barry Grove at Geanies. Ed).

Other stones likely to have been brought from further afield are the bosses TR5 and TR6 and the interlace panel TR 2, which are of sandstone which might have affinities with the Triassic deposits on the south side of the Moray Firth.

The grave-marker TR21 is also probably imported. It is composed of clast-free colour-laminated fine grained sandstone. The broken surfaces exhibit 5YR7/1 'light grey' and darker 2.5YR5/2 'weak red' laminated bands. The darker bands, between 5mm and 10mm thick, are rich in biotite mica. The high mafic content of this sandstone gave a comparatively high magnetic susceptibility average reading of 0.1225 (compared with, for example, the 0.015833 of TR1). Although the quarry at Shandwick has reddish laminated sandstones with mica-rich

bedding planes, TR21 bore no resemblance to the range of stone in the quarry and does not seem to come from the Tarbat peninsula.

Stone used for church building

TARBAT OLD CHURCH (St Colman's) contained a variety of sandstones from known and unknown sources. Most of the stone does not appear to be from the immediate vicinity of the building. Evidence of fire-burnt stones was apparent in the crypt. The resultant damage to the stones would invalidate any magnetic susceptibility readings.

South exterior wall

The basal stones forming the first visible horizon of the wall on the south side of the church (17/F63/1180)(**Church 2**), to the right of the entrance, appear to be sandstone of UORS age. Some blocks are fine to medium grained, while other ones are of a coarser texture up to coarse grain size. Clasts of mudstone or voids, where the softer mudstone has weathered out, can be up to 10mm long by 2mm thick. Weathering of the stones has reduced even more the original low mafic content and the mica content. The colour varies from 2.5YR 6/2 'pale red' to 2.5YR 5/2 'weak red'. They were probably extracted from outcrops in the Portmahomack to Tarbat Ness area.

The main fabric of the lower south external wall (17/F64/1181)(**Church 6**) is comprised from a 10YR 6/6 'brownish yellow' well sorted medium sandstone. It is of massive appearance and well cemented, containing no mudstone or lithic clasts. The general appearance would suggest that the stone came from the MORS beds of the peninsula. The 10YR 5/4 'weak red' coloured fine to medium grained laminated sandstones used for the upper courses of the wall (when the wallhead was raised in the 18th century)(**Church 6**) immediately below the roof line are again not found locally. Mica was evident on the bedding planes. Mudstone clasts varied from peas size up to 80mm by 35mm. Some clasts have green coloured reduction spots. The stone was not from the former quarry at Shandwick or from the Tarbat peninsula. It is of ORS appearance possibly from the Black Isle/Cromarty Firth area.

Threshold Stone

The threshold stone (20/F108/1253)(**Church 2**), now split, is formed from an extremely fine grained sandstone. Clearly it is not from the immediate vicinity but has affinities to MORS from the south side of the peninsula on the shore near Balintore.

Crypt

The east wall of the crypt (19/F3/1002)(**Church 1 or 4**) contained many fire damaged sandstone blocks. No glacial erratics were noted. The stones in general had more in common with MORS sandstones than the local UORS from Portmahomack beach. The west end of the crypt (19/F4/1003)(**Church 4**) again showed evidence of major rebuilding and fire damage. No igneous or metamorphic erratics were noted and the sandstones in general indicated a non-local source. Again, they appear to be from the MORS of the peninsula.

West end of nave

The pillars at the west end of the church are imported (**Church 5**). The grain is very fine and compact with a high quartz content. No lithic or mudstone clasts were noted and the 5Y 5/3 'olive' colour was noted to change to a 5YR 5/3 'reddish brown' on a weathered surface. The stone does not resemble any from the Tarbat peninsula. The very fine to fine current bedded sandstones forming the west belfry arch at the northwest corner of the church (**Church 5**) are 5Y 6/3 'pale olive' in colour. Mudstone clasts of 5Y 4/1 'dark grey' to 5GY 4/1 'dark greenish grey' colour can be seen and the bedding is picked out by grey 1mm thick laminae. Some Fe blebs are present with Fe staining on the surface. The stone is not from the immediate area of the church and sandstone with Fe blebs has not been recorded in the peninsula. The sandstone of the extant belfry provided a contrast to the stone found in the rest of the church (**Church 6**). The honeycomb nature of some blocks indicated its variable weathering qualities and other blocks were prone to algal staining. The colour on clean faces varied from 2.5Y 7/2 'light grey' to 2.5Y 7/4 'pale yellow'. The well sorted very fine to fine grained sandstone exhibited numerous sedimentary structures including current and planar bedding. The stone does resemble a sample from the former quarry at Cadboll obtained last November by Mr. B. Grove. Again, this indicated that sandstones from the MORS were preferred for a high status building.

Conclusion [MOHC]

The stone outcropping on the west coast in the neighbourhood of the site is UORS, of reddish hue and often weathered. The stone outcropping on the east side of the peninsula is MORS, of yellowish hue and of higher quality.

One stone used for carving Pictish sculpture was obtained in the immediate locality (UORS TR28). Two of the grander carvings used stone from the east coast (MORS: TR1, and TR 10 with TR20). A third (TR2, 5 and 6) may have used stone from triassic deposits on the south

side of the Moray Firth. The grave marker TR21 was certainly imported from an unknown origin beyond the Tarbat peninsula.

If Church 1 survives in the east wall of the crypt it was built in MORS (east coast). Church 2, the first Medieval Church, was built in UORS apart from its threshold, which was of the better quality MORS. Church 4 (13th century) was of MORS as were Church 5 and 6 (Post-Medieval) including the Belfry. The pillars for Church 5 were imported.

[Ed CAS & MOHC July 2013]