

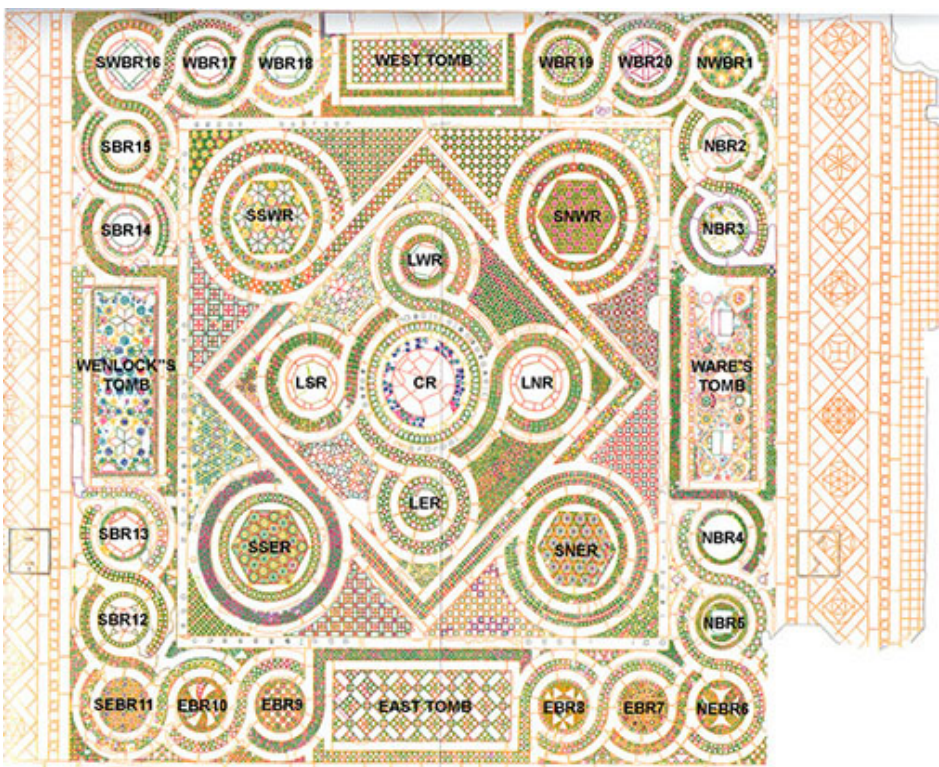
Westminster Abbey: the stones of the Sanctuary Pavement

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In October 2014, Westminster Abbey was voted one of the UK's 100 Great Geosites by the Geological Society of London for its outstanding urban geology¹.

This brief guide to the stones used in the Westminster Abbey Sanctuary Pavement was written to support a field trip to view the pavement for the London Open University Geological Society (LOUGS) on 20th February 2014.

The Sanctuary Pavement of Westminster Abbey lies at the heart of the Abbey church envisioned and created by King Henry III in the late 13th Century. Designed to commemorate the translation of the bones of St Edward the Confessor from the crypt to a new shrine (situated behind the High Altar) the pavement is in the Cosmatesque style which had been popular in Rome over the preceding two centuries. Cosmatesque floors may be described as a 'patchwork quilt' of stones. Unlike mosaics where the stone pieces are all small cubes, Cosmatesque designs feature stones of different shapes fitted together to make a pattern. This type of stone-work is described in architectural terms by the Roman name '*opus sectile*'. The Cosmati were a family of decorative stone masons living in Rome in the 12th Century who established this method of paving. Although there is substantial evidence that the paviours responsible for laying the Sanctuary Pavement here at Westminster did indeed come from Rome, we cannot be sure that they were members of the Cosmati Family, hence of the descriptor Cosmatesque in this example. Nevertheless, the Westminster floor is a remarkable example of Italian Medieval decorative stonework, and the only one of its kind occurring north of the Alps.



The design of the floors typically involves a framework which encloses areas polychromy stonework. The design here at Westminster is a quincunx within a quincunx, surrounded by a border of roundels and tombs. Such motifs are typical of Cosmatesque floors encountered in the churches of Rome and in the omphalus at the great Byzantine Church of Aghia Sophia in Istanbul. Symbolically this shape evokes a 'centre' and a sacred place. It is no coincidence that the omphalus in Aghia Sophia

marked the place where the Emperors received their crowns and the centre of the Westminster floor locates the position of the Coronation Chair of the English monarchs crowned here.

The materials used in Cosmati work were decorative stones (marbles and porphyries) and glass laid in a bed of mortar. Typically it appears that stones were 'acquired' from Roman-period archaeological sites and recut to form the pieces. Columns and pilasters were sliced up like salami to make roundels and other pieces were cut with squares and compasses to make a variety of other shapes. In Italian examples, the

¹See more at <http://www.geolsoc.org.uk/100geosites>

framework is traditionally laid using Carrara marble, however local tastes and practicalities (Carrara marble is not well suited to damp environments) dictated that Green Purbeck Marble is used here. Following the laying of the original floor – the ‘Primary Mix’ in the 13th Century, clear phases of restoration took place in the mid 17th Century (Secondary Mix) and around the turn of the 18th Century (Tertiary Mix). Both these phases used stones that would have been stock in trade at these times. The eastern margin of the floor, adjacent to the Altar, was replaced by architect George Gilbert Scott in the mid 19th Century. Scott used both recycled and new stones to complete his designs.

Purbeck Marble is derived from the Early Cretaceous Purbeck Group of freshwater Limestones outcropping on the Isle of Purbeck in Dorset. The three ‘marble’ beds – those able to take a high polish – are located in the uppermost Peveril Point Member. They are distinctive in that they are packed with *Viviparus* sp. gastropods. Purbeck Green Marble, which is the variety predominantly used in the Sanctuary Pavement also contains the thick-walled freshwater mussel *Unio* sp.

The Porphyries

Green and purple porphyry are the most abundant stone varieties used on the Sanctuary Pavement, primarily in the Primary Mix though some have been recycled into Secondary Mix and the Scott Repair. These stones are well provenanced and it is certain that the quarries from which they were derived had long since fallen out of use. Consequently the only source of these stones in the 13th Century would have been as spolia from Roman-period archaeological sites. The green porphyry called by the Romans **Lapis Lacedaemonius** came from quarries near Sparta in the Greek Peloponnese and was quarried from the Bronze Age until around the 5th Century AD. They are altered, Triassic basaltic lavas. The purple ‘**Imperial Porphyry**’ comes from quarries at Mons Porphyrites in the Gebel Dokhan of Egypt’s Eastern Desert. It is a trachytic andesite, dated to c. 600 Ma. The main phases of quarrying was initiated under the Emperor Tiberius in the 1st Century AD and continued until the 5th Century.



Other stones

This is a summary of the main stones used on the floor; many one-offs also occur. If you find something unusual let me know and I will try to identify it for you!

Africano – a few fragments of this rare, red and black marble breccia occur. It could only have been from Roman ruins as the quarries near Izmir in Turkey were worked out and forgotten at the end of the Roman period. The marble breccia was an isolated block in the Bornova Tectonic Melange. This stone is uncommon on the floor but surprisingly occurs in the Tertiary Mix indicating that some of these stones were also being recycled.

Alabaster – Alabasters are used in several places on the floor, but most spectacularly the ‘onyx marble’ of the central roundel. This is probably Turkish in origin, but a certain source cannot be ascribed.

Ammonitico Rosso – a very eroded roundel of Jurassic Ammonitico Rosso from the Veronese Alps and is probably associated with either the Secondary or Tertiary Mixes

Black Coralline Limestone – this stone, a Carboniferous limestone from either Belgium, Ireland or Derbyshire is used in the Tertiary Mix.

Breccia Corallina – a breccia of white marble in a coral-pink matrix. This stone was quarried in ancient Bythinia from the 1st Century AD.

Carrara Marble – White marbles are very difficult to identify but Carrara was the main source in the 17th – 19th Centuries and therefore the white marble used in the Tertiary Mix is probably derived from the Alpi Apuane.

Egyptian Gabbro – Gabbros from Egypt occurs as isolated fragments within the general pattern of Primary Mix stones and are used in a large panel on Archbishop Ware’s Tomb. Known to the Romans as Lapis Ophites, this stone was quarried at Wadi Semna in the Eastern Desert and is part of the Pan-African orogenic crust, intruded at c. 600 Ma.

Rouge Royale – A Devonian, red, stromatolite-bearing, reefal limestone from the area around Dinant in Belgium. Though probably quarried since Roman times, this stone occurs only in the Secondary and Tertiary Mixes. It was actively quarried was probably stock for 17th-19th Century decorative stone merchants. Rouge St Remy is a red and grey variety of this stone.

Tadcaster Limestone – Tadcaster Stone is magnesium limestone from the Permian Cadeby Formation of N. Yorkshire. It occurs with the Primary Mix acting as a foil to the green and purple porphyries. In Italian examples of Cosmatesque floors a yellow limestone known as Giallo Antico is frequently used in this context. One or two fragments of this stone occur in the Westminster floor, but it is rare. For whatever reason this stone was unavailable and it seems that a British Limestone was used in its place.

Touch – Black Belgian limestone, used as a touchstone for assaying silver. It is a black, mostly fossil-free limestone. Similar stones were quarried in several localities of Upper Devonian and Lower Carboniferous strata in Belgium but primarily from the Molinee Formation around Namur. This stone is also used with Carrara Sicilian Marble for the chequerboard pattern in the Nave.

Verde Genova – green serpentinites occur in the Secondary Mix where they replace the unobtainable Lapis Lacedaemonius and also in the Tertiary Mix. The main source of serpentinites used in decorative stonework was the Piedmont Zone and the Genoa region of the Italian Alps. These serpentinites are difficult to locate to source, but they are very similar in appearance to the Verde Genova variety and this source is certainly time -appropriate.

Verde di Prato – this is another Italian Alpine serpentinite, which like Verde Genova above represents Cretaceous oceanic crust obducted during the Alpine Orogeny. This is however a distinctive variety with blotchy, silvery, bastite porphyroblasts in a dark green matrix. It is used in Scott’s repairs.

‘Scott’s Porphyry’ – this is an unknown rhyolite porphyry with distinctive pink K-feldspar phenocrysts in a grey-brown glassy matrix and acquired by George Gilbert Scott for his repairs. I would be very grateful if anyone recognises this stone and could let me know what it is!

The Glass

Both opaque and transparent coloured glass is also used in the floor and would certainly enhanced the ‘sparkle’ when observed in candlelight. The glass was conserved by Sandra Davison and analysed by Ian Freestone and Colin Stapleton. There are six colours of transparent glass and chemically they are potassium-lime glasses, with the potassium derived from wood ash. Such glass was known as ‘Forest Glass’ because of this and is probably French in origin. The opaque glass is soda lime glass (right), the sodium is

also derived from plant ash with tin oxide added as an opacifier. These are also probably French bearing a strong similarity to enamels made in Limoges at around this time.



The High Altar

The Altar and its setting were designed and installed by Sir George Gilbert Scott in the 19th Century and embellished with some 'antique' stones presented by Lord Elgin. These are three roundels, again salami column slices in Imperial Porphyry set in opus sectile work of predominantly Irish marbles. Two varieties of green Connemara marble are present; a dark, moss green variety called Irish Green and a more calcite-rich apple-green variety which is more typical of this stone. Two red stones are present. The darker, more uniformly red stone, with white crinoid ossicles is Cork Red (also known as Victoria Red) a Carboniferous crinoidal limestone derived from several quarries around the town of Cork. The mottled red stone is Rose Vif, a nodular Devonian Limestone from the French Pyrenees. The pale yellow limestone which is also probably Tadcaster Stone (as described above). The thin strips of black limestone, cross cut by white calcite veins could be from many places. However a touch of red iron staining and red iron oxides concentrated in stylolites hints at this stone being one of the Plymouth Marbles, a series of tectonised Devonian limestones from Devon.



Further Reading

Westminster Abbey Cosmati Pavement: <http://www.westminster-abbey.org/conservation/home>

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Borghini, G. (Ed.), 2004, Marmi Antichi., De Luca Editori D'Arte., 342 pp.

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Pajares-Ayuela, P. (transl. M. Fleming Alvarez), 2001, Cosmatesque Ornament: Flat Polychrome Geometric Patterns in Architecture., W. W. Norton & Co., New York, London., 320 pp.

Siddall, R., 2013, Medieval mortars and the Gothic Revival: The Cosmati Pavement at Westminster Abbey., 3rd Historic Mortars Conference, Glasgow, 11-14 September 2013., 8 pp.

A library of videos explaining all aspects of the Pavement's making and meaning is available to view online at <http://www.westminster-abbey.org/conservation/video-library>



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Siddall, R., 2014, Westminster Abbey: the stones of the Sanctuary Pavement, Urban Geology in London No. 22., 5 pp., <http://ruthsiddall.co.uk/Walks/LOUGS-Westminster.pdf>