

## Building Stones in The City of London:

### A Walk from Bank Underground Station to the Guildhall and Gresham Street



Ruth Siddall

UCL Earth Sciences, [r.siddall@ucl.ac.uk](mailto:r.siddall@ucl.ac.uk)

<http://www.ucl.ac.uk/~ucfbrxs/Homepage/UrbanGeology.htm>

*Eric Robinson wrote his two 'London: Illustrated Geological Walks' books in 1984 and 1985. Both of these featured the Guildhall Area, however this part of the city of London, just north of St Paul's Cathedral, has been transformed since then, with few of the Buildings that Eric described still standing. Amongst these of course is the 15<sup>th</sup> century Guildhall, which was almost obscured from view in the 80s, the yard was opened up in the 1990s and a number of new buildings have sprung up along the western end of Gresham Street. This walk begins at Bank London Underground Station.*

From Bank station, walk west, away from the Bank and the Royal Exchange towards the unmissable building that is 1, Poultry, with its prominent cylindrical clock tower and clad in bands of red and buff sandstone.



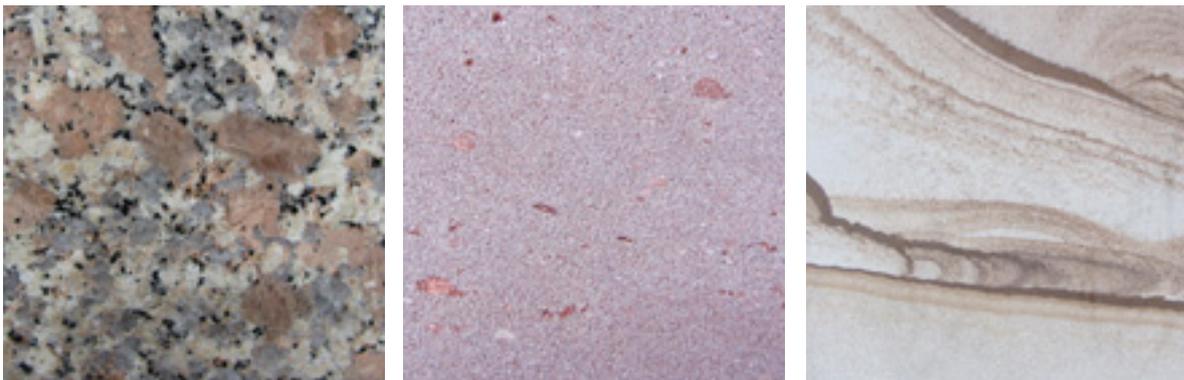
### 1, Poultry

Love it or hate it, 1, Poultry is a striking building, built in the mid-1990s by Stirling Wilford and Associates Architects. When Eric Robinson wrote his Geological Walks in 1984, this site was occupied by Mansion House Buildings, a Victorian gothic pile that housed Mappin & Webb's store. Eric was aware that there were plans afoot for redevelopment of this block and wished for a 'geological vote on what might happen here.' He offered that he 'would lead any campaign for diverse natural stone as seen in the existing buildings, and be against anything which would see the substitution of metal and glass'.

Well, Eric's wish certainly came true in spectacular style. 1, Poultry is faced in bands of red and buff sandstones which are easily observed from street level. The quietest and safest place to do this is in the central atrium, Bucklersbury Passage, accessed from either Poultry or Queen Victoria Street. The stones used for the cladding were sourced by Gormley Group.

The foundations are of Sardinian Beige Granite, also known as Rosa Galura, with its distinctive pink orthoclase feldspar phenocrysts and blotchy grey quartz. This comes from the c. 310 Ma Variscan granites of northern Sardinia. The red sandstone is Wilderness Red from the Wilderness Quarry in the Forest of Dean. It is the St. Maughan's Formation of the Old Red Sandstone, a red, cross-bedded sequence of fluvial and channel sands, known for its fossil fish. Evidence of their fluvial origin is seen in the slabs used at 1, Poultry in the presence of red siltstone rip-up clasts.

The buff-coloured sandstone has spectacular Liesegang-banding with reaction fronts depositing iron oxides. These stones are known in the building trade as 'picture sandstones'. This one comes from Queensland, Australia. It is the Helidon Sandstone Formation, from the Jurassic Bundamba Group, it too is a fluvial sandstone, silicified by volcanic fluids from the Toowoomba Basalts erupted at 22 Ma. This event is also responsible for the formation of the fluids which formed the Liesegang banding.



The three stones used at 1, Poultry, from left to right; Sardinian Granite (field of view 5 cm), Wilderness Red (FOV 25 cm) and Helidon Sandstone (FOV 25 cm).

The interior of the atrium is clad in blue ceramic tiles supplied by Hatherware. The variety used is called Architectural Faience. A reminder of the Mansion House Building can be seen on the façade above Bucklersby Passage on Poultry. Above the arch are four terracotta panels created by the sculptor I. C. Kremer in 1875 which were incorporated into the new building. Each frieze is made

up of 10 pieces of terracotta and depict processions of British monarchs; Edward VI, Elizabeth I, Charles II and Victoria, that would have once passed the site.



*Queen Victoria's procession; Kremer's frieze salvaged from Mansion House Buildings and reused on Poultry. Walk back towards Bank Tube, and take a left down Prince's Street and on to Gresham Street.*

### 95-99 & 60 Gresham Street

At the end of Prince's Street on the left hand corner with Gresham Street is 60, Gresham Street, by Gibberd Ltd architects, clad in Portland Stone Whitbed and Roach, with a grey granite at pavement. The origin of the granite is unknown. It was supplied by Realstone and is called 'Evening Grey'. It is probably Chinese in origin. The floor of the interior reception (easily seen through the big windows) is Baycliff Limestone, a calcarenite of the Carboniferous Urswick Limestone Formation, quarried in Cumbria. Baycliff Hags Quarry, near Ulverston, was acquired by Burlington Stone and reopened in 2005, prior that it had operated on a small scale, and hopefully this British limestone will become more popular as it is an excellent rival for the French and Portuguese Limestones so often seen as flooring tiles.

Across the road, the new build, by Rolfe Judd Architects (2009) on the corner of Coleman Street uses the façade of the original 1927 building by Robert Angell & Curtis. The upper floors of 95-99 Gresham Street, both the new and the old façade are also Portland Stone base bed. At pavement level, there is a course of grey granite, very similar to that at number 60.

*Continue along the south side of the road.*

### 48 Gresham Street

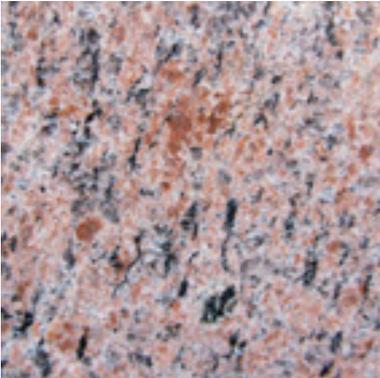
This building is currently occupied by Be AT One café. It is of little architectural interest but of geological note because of the fine panels of red Belgian 'marble' cladding the engaged pillars of the façade. These red limestones, known as Rouge Royale or Rouge Belge are from Frasnian (Upper Devonian) reefal bioherms from the Dinant region of Belgium. There are numerous reef mounds in the region, and they have all been quarried at some time or another. The stone has been commercially worked since the 17<sup>th</sup> Century and was very popular



around this time. It continued in popularity, but principally for interior decorative stonework. It is not so commonly seen in an exterior setting.

*Cross over to Guildhall House on the north side of the street.*

### **Guildhall House, 81-87 Gresham Street**



Guildhall House is a broad fronted building, occupying the street up to the corner of Gresham Street and the entrance to the Guildhall Yard. It is a fairly non-descript building, with the upper stories painted white. However the ground floor is clad in a pink-red meta-igneous rock (orthogneiss), with a strong foliation defined by schlieren and augen of pink orthoclase, hornblende and biotite. Quartz is very abundant as grey crystals (left). It is a metagranite or, more probably a metarhyolite. The exact origin of this stone is unknown, but it strongly resembles the metarhyolites from Flisa in Norway (Heldal & Neeb, 2000), part of the Proterozoic

Transcandinavian Igneous Belt.

*Turn right into Guildhall Yard.*

### **Entrance to Guildhall Yard**

The entrance to the Guildhall Yard from Gresham street has been paved with Caithness Stone. This stone comes from the far north western tip of Scotland, from the Devonian strata of the Orcadian Basin. Caithness Stone is a flagstone, splitting along bedding planes. The stone is dark grey with patchy iron staining. The fresh surfaces of the stone are heavily bioturbated, with casts of pits and burrows standing proud. Fossils of plant debris are also present. The sediments were deposited in lakes of the Orcadian basin some 370 million years ago. Fossil fish have been found in the Caithness Flags paving the streets of Edinburgh, but unfortunately, no obvious vertebrate fossils are present in this example.

### **Guildhall Yard**

The Guildhall Yard was created in the redevelopment of the Guildhall between the 1960s and 1990s under the architects Giles Gilbert Scott and his son Richard. Up until the early 1970s, Guildhall yard was only as wide as the white Porch of the Guildhall. The area was opened up and significant redevelopment of the area produced new open spaces and a new art Gallery. During this time the archaeological remains of the Roman amphitheatre were found and excavated.

The Guildhall Yard is paved with a geometric pattern of sawn stone slabs and cobble stones which utilise a variety of limestones and igneous rocks. From the Caithness Stone paved entrance from Gresham Street, a pathway of white Portland Stone leads to the entrance of the Guildhall. An ellipse in black slates, of unknown origin, marks the perimeter of the Roman amphitheatre. The most distinctive stone used in Guildhall Yard is Baltic Brown Granite. This stone is frequently seen in London's buildings, but it comes from quarries in Ylmaa, SE Finland. This is a very distinctive variety of granite known as rapakivi granite. The large, round feldspar phenocrysts are distinctive, set in a dark biotite and hornblende-rich groundmass. Careful examination of the phenocrysts shows them to have large cores of pink orthoclase, surrounded by a rim of greenish plagioclase. Because plagioclase forms at higher temperatures to orthoclase, its presence on the rims indicates and later influx of magma into the crystallising magma chamber. Baltic Brown comes from the Vyborg Massif of south-east Finland and was intruded c. 1.6 billion years ago.

Portland Stone Whitbed is used to contrast with the Baltic Brown and bands of these two stones alternate with bands of grey diorite setts, possibly derived from Guernsey in the Channel Islands and another heavily bioturbated, yellowish-cream limestone. Some slabs of this contain large oyster shells and other fossils. The origin of this stone is unknown but it is possibly a Jurassic limestone from the French Jura.



*Guildhall Yard. The black slate band marks the perimeter of the Roman Amphitheatre.*

## **The Guildhall**

The Guildhall was the seat of the Civic administration of the city of London, its role was to ensure that businesses and trade was operated fairly and efficiently within what was to become the Corporation of London. The first Guildhall was possibly established in this site in the late 10<sup>th</sup> Century. The present structure was completed in 1430 by Master Mason John Croxton and funded by a number of wealthy citizens, including the benefactors of Lord Mayor Richard Whittington's will. Miraculously it survived the great fire of London, losing only its roof to the flames. The 'Hindoo-Gothic'-style porch was added in the 1780s by architect George Dance. The Guildhall once again lost its roof during WWII and this was eventually replaced in the 1950s by architect Giles Gilbert Scott.

The Guildhall is roofed with green Collyweston Slate. Part of the Jurassic Lincolnshire Limestone Formation (Inferior Oolite Group), the 'slates' are actually cross-bedded, sandy limestones which split along the cross-bedding planes. Although named after the village of Collyweston in Northamptonshire, the slates are extracted from quarries along the outcrop of the beds in north Northamptonshire, south Lincolnshire, Rutland, and northwest Cambridgeshire.

Dance's ornamental porch, which uses Gothic, Classical and Indian inspired architectural elements is built from Portland base bed freestone.

The original 15<sup>th</sup> Century walls of the Guildhall are built from carefully squared blocks of Kentish Ragstone. The Ragstone comes from the Hythe Formation of the Lower Greensand Group and there are numerous quarries along the outcrop of the unit in Kent. It is composed of hard, well cemented layers of quartz and glauconite with shell debris and locally brown phosphatic nodules. Alternating softer, more calcareous layers are known as 'Hassock'. The stone is mainly used for rubblestone walling. It has been used widely since the Roman period and is the only stone from Kent to have been exported outside the county. It was much used for building in London from 12th-16th Centuries, only losing its dominance after the introduction of Bath Stone and Portland Stone in the 17<sup>th</sup> Century.

### **Guildhall Art Gallery and the Roman Amphitheatre**

The new Guildhall Art Gallery was built in the late 1990s, again designed by Richard Gilbert Scott. The foundations are of polished Sardinian Beige Granite, as seen at 1, Poultry. The rest of the building is clad in Portland Stone Whitbed. However the engaged columns along the front elevation have alternating bands of Whitbed and Portland Roach, the latter with cavities formed from casts of fossil gastropods and molluscs.

Six octagonal arches open into the portico of the Guildhall. A series of portrait busts by Tim Crawley are mounted in the two northern and two southern arches. They represent four people with historical importance to the City; Oliver Cromwell, Christopher Wren, William Shakespeare and Samuel Pepys. They are carved from Portland 'best bed' freestone.



The Portico and foyer of the Guildhall are also paved with decorative stones (above). These include Baltic Brown as seen outside, but also red Rosso Verona which is often accompanied as here, with pink Nembro Rosato. These stones are complemented with a cream travertine. Rosso Verona and Nembro Rosato are both stones of Italian origin, derived from the Jurassic Trento Carbonate Platform north of Verona and east of Lake Garda in northern Italy. Both are condensed pelagic limestones; the red variety is of the ammonitico rosso facies of the European Alps, a nodular red limestone, rich in ammonite facies.

Remains of the Roman amphitheatre can be seen preserved in the basement of the Guildhall Art Gallery and are evocatively displayed and certainly worth visiting. The first Roman amphitheatre on the site was probably built in around 70 AD, and burned down some 50 years later. A new amphitheatre was built on the site with stone foundations, but probably a timber superstructure. The foundations of this 2<sup>nd</sup> Century AD amphitheatre were built of rough blocks of Kentish Ragstone. Of more interest are the fragments of decorative stones, much admired by the Romans, which were presumably used to decorate the dignitaries' box.

Three varieties of Roman decorative stones have been found in the amphitheatre. Two are exotic. Lapis Lacedaemonium, also known as Porfido Verde Antico comes from Krokeai , near Sparta in Greece. This is a beautiful stone, an altered porphyritic basalt of Triassic age with green plagioclase phenocrysts set in a dark green matrix. Another porphyry, this time purple comes from the Eastern Desert of Egypt. This is derived from the late Proterozoic Dokhan Volcanics and was quarried from Mons Porphyrites. This stone is generally known as Imperial Porphyry for its purple colour – porphyry comes from the Latin for ‘purple’ and this stone has given modern geologists the word ‘porphyry’ to described an igneous rock of bimodal grainsize. A third decorative stone used in the amphitheatre is a little more local. Green Purbeck Marble comes from quarries around Swanage in Dorset. It is a freshwater limestone containing *Viviparus* sp. gastropods and *Unio* sp. Mussels, and belongs to the Early Cretaceous Purbeck Group. It is known to have been quarried from at least 43 AD.



Examples of Roman decorative stones of the varieties found in the amphitheatre. These are from the Cosmati Pavement at Westminster Abbey and the stones used to lay this floor in the late 13<sup>th</sup> Century may well have been recycled from Roman buildings in London. From left to right Imperial Porphyry, Lapis Lacedaemonium & Green Purbeck Marble.

### 30 Gresham Street

30, Gresham Street was designed by Sidell Gibson Architects. It is primarily clad with Portland Stone. The foundations are of a metamorphic rock. This is murky olive-green rock, very well banded with segregations of black pyroxenes in an otherwise feldspar-rich rock. This is not particularly attractive stone and its origin is unknown.



Cross over the road and turn right into Aldermanbury and take a short walk down to St Mary's Aldermanbury Garden.

#### St Mary's Aldermanbury Garden

The Church of St Mary's Aldermanbury was removed stone by stone in 1966 and transported to the USA where it was re-erected as a memorial to Winston Churchill in Fulton, Missouri. The story is inscribed on a block of diorite in the garden which surrounds the footprint of the church.

A monument to Shakespeare's friends and fellow actors, John Heminge and Henry Condell who collected Shakespeare's works also stands in the garden. Heminge and Condell were buried in the churchyard. The plinth is made from pink Peterhead Granite from north of Aberdeen and the book is of 'oatmeal'

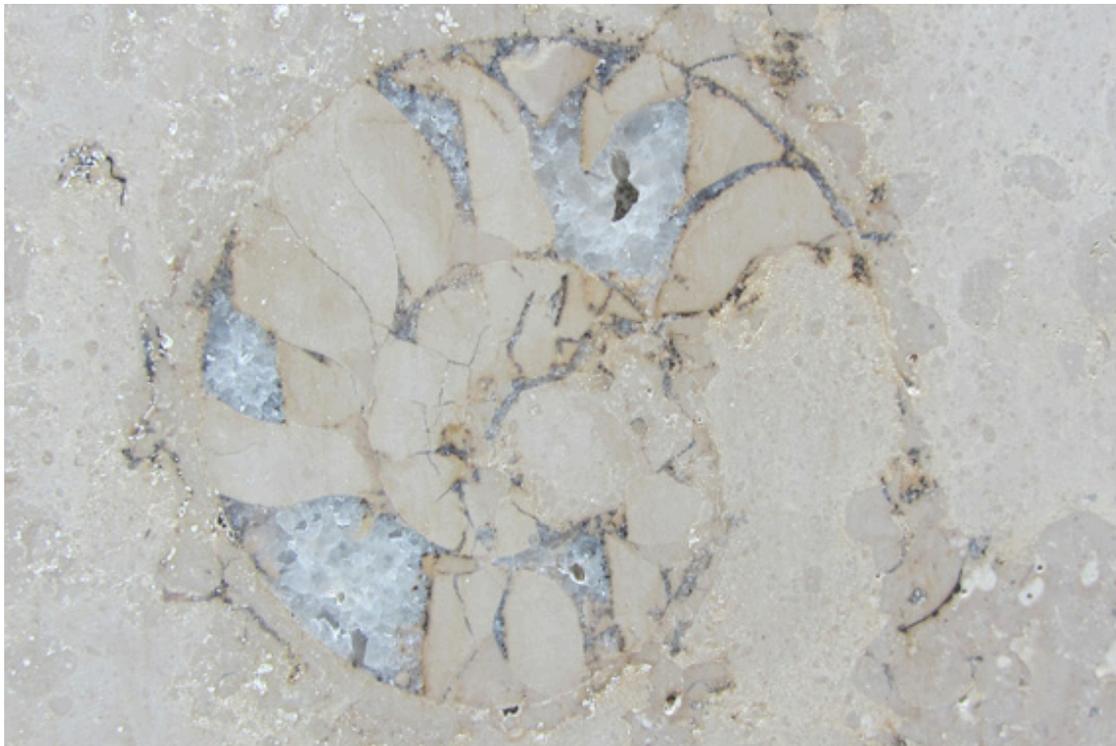
Kemnay Granite, an intrusion to the west of Aberdeen. Both are part of the Caledonian Late Tectonic Granitoids suite of eastern Scotland.

*Left: Shakespeare Memorial, St Mary's Aldermanbury Garden*

*Return back to Gresham Street, and cross over to take another short diversion down Milk Street on the left (heading south). The paving on Milk Street has good examples of York Stone, showing a variety of sedimentary structures and Liesegang banding.*

### **Pizza Express**

Head down Milk Street towards Pizza Express on the corner of Russia Row. The Pizza Express building and its neighbours are clad with Jura Yellow (Jura Gelb) limestone. This is a fossiliferous, lithographic limestone from the Treuchtlingen Formation of Middle Kimmeridgian (Jurassic) age. It is rich in macrofossils, with particularly good varieties of ammonites, belemnites, corals, bryozoan and sponges, the latter looking rather like deflated bicycle tyres. This limestone is from Bavaria in southern Germany.



*Well preserved ammonite fossil on one of the columns of Pizza Express on Russia Row.*

*Return back to Gresham Street.*

### **20 Gresham Street**

20 Gresham Street, on the corner of Milk Street and Gresham Street is at first glance of no geological interest, being all glass and steel on the outside, designed by architects Kohn Pederson Fox Associates. However, the interior is clad with softly sculpted travertine, 'Este Cream' from the deposits at Tivoli, near Rome in Italy. These are Pleistocene travertines, formed from warm waters derived from the Roman Volcanic Field (Alban Hills) and associated hot springs which flooded the area forming Lake Tiburtinus. The interior was commended for a Stone Award in 2010.

### Goldsmith's House

The solid foundation course of the early 19<sup>th</sup> Century Goldsmith's House is formed of spectacularly megacrystic granite with very large K-feldspar megacrysts, 10-15 cm in length and constituting up to 30% by volume of the rock. The stone is axe-dressed, but nevertheless, the minerals and textures are clear. These are set in a coarse-grained groundmass of k-feldspar, plagioclase and biotite. Striking are clusters and rosettes of black schorl tourmaline, several centimetres across, are evenly distributed throughout the rock. This is so-called Giant Granite from Dartmoor. It was extracted from quarries on the moor at Haytor, Princetown & Merrivale. This stone was particularly known for its high load-bearing strength, and was primarily quarried for export outside Devon. Mainly used in bridge and harbour foundations, this is a good example of its use in urban architecture. The Dartmoor Granite is the largest of the intrusions collectively known as the Cornubian Batholith of SW England. It was emplaced at c. 290 Ma after the end of the Variscan orogeny.



*Dartmoor Giant Granite in the foundations of Goldsmith's House, FOV 20 cm.*

### 49-55 Gresham Street

49-55 Gresham Street houses offices and also, rather incongruously, The Red Herring public house. The foundations are of Blue Pearl, a monzonite from the Larvikite Plutonic Complex in southern Norway. A well known decorative building stone, it is a coarse grained rock with potassic feldspar, oligoclase antiperthite, titanite, titanomagnetite, biotite and nepheline. The oligoclase demonstrates the strong and distinctive blue schiller. The Complex was intruded during the Permian at around 297 Ma. A pale grey granite clads the upper stories. This is Luna Pearl (also known as Blanca Sardo). This is a late Carboniferous granite, around 10 million years older than the larvikite in intruded towards the end of the Variscan Orogeny in Sardinia. It contains white, subhedral plagioclase feldspars and grey, fractured, translucent quartz. The mica is biotite and

there are about 5% pink feldspars, some zoned with white rims. These are partially kaolinised in this example, often giving a pitted appearance to the cores of the plagioclase.

### 31 Gresham Street

31 Gresham Street is another Portland Stone edifice, but with a contrasting foundation course. This time it is a very coarse-grained, foliated, granitic rock. Greenish-grey in colour, it contains feldspar megacrysts of microcline feldspar with plagioclase, quartz, biotite and hornblende. It belongs to the Charnockite suite of Precambrian rocks. Its origin is unknown, but similar stones are derived from South Africa, Australia and Brazil.



31 Gresham Street. Left: strong foliation on the charnockite can be seen in the foundations; Right: the coarsely crystalline texture, with large grey-blue microcline feldspars. Field of view is ~ 8 cm.



### 2 Gresham Street

The foundations of 2, Gresham Street are built of axe-dressed Baltic Brown Granite or wiborgite to give it its correct geological name, so-called after the Vyborg (Wiborg) Massif in Finland. It is an A-type granite, meaning that it was intruded in a non-orogenic setting, and therefore within extensional environment in the Proterozoic crust. Although this stone has already been observed in the Guildhall Yard, it is worth looking at here, it has particularly well-developed examples of the classic, rounded feldspar megacrysts. The rest of the building is clad in Portland stone base bed.

Above the first storey windows, unfortunately out of reach, is a band of yellowish limestone which is possibly Jura Gelb as observed on the Pizza Express building on Milk Street.

*Turn left up St Martin's Le Grand and you will find yourself at St Paul's Tube Station.*

## Acknowledgements

I would like to thank Dr Eric Robinson for confirming the stone identifications at 1, Poultry and also bringing to my attention the debate over the use of this site and the reactions to the building once built.

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*York Stone Slabs on Milk Street*

**Ruth Siddall, 2013**

**UCL Earth Sciences, [r.siddall@ucl.ac.uk](mailto:r.siddall@ucl.ac.uk)**

**<http://www.ucl.ac.uk/~ucfbrxs/Homepage/UrbanGeology.htm>**