

Building Birmingham: A tour in three parts of the building stones used in the city centre.

Part 1: From the Town Hall to the Cathedral

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Birmingham is England's second city, rising to prominence as an important industrial and manufacturing centre in the 18th and 19th Centuries. It was one of the first of the British urban centres to undergo an industrial revolution, and growing industries brought great prosperity to the city. This led in turn to grand civic buildings, firstly in the Victorian Classical style and later embracing the Gothic Revival and Arts and Crafts movements. This walk introduces the building stones used in the civic centre of Birmingham, from the Classical-style Town Hall to the late 20th Century granite-and-glass office blocks on Colmore Row. Central Birmingham not only presents us with a grand architectural tour of the last 200 years but an accompanying social history in stone.

This is the first of three building stone walks around Birmingham, Part 2 will visit Centenary Square and Brindley Place and the third walk will examine the stones used in the retail districts of the city. These have been produced in collaboration with and on behalf of the Black Country Geological Society. This walk starts at the Town Hall (*below*) and takes us through the civic heart of Birmingham in Victoria Square to Colmore Row, finishing at the Cathedral. Unless otherwise cited, all architectural information comes from the Pevsner's Architectural Guide (Foster, 2007). The walk extends the building stone and fossil tours by Shilston (1994) and Schroder et al. (2015).



Town Hall

Birmingham Town Hall is the gem in the city's urban geological crown. This splendid building, resembling a Doric temple, straight out of Rome and indeed it is modelled on the Temple of Castor and Pollux in Rome by its architects, the ill-fated Joseph Hansom and John Welch. The building project started in 1832, but Hansom soon went bankrupt and construction problems prevailed. Despite opening in 1834, a third

architect, Charles Edge was employed in 1835 to sort things out. The Town Hall is built from brick but clad with **Penmon Marble** from Anglesey. The stone is of great interest, being donated to the City of Birmingham by Sir R Bulkeley, the owner of the Penmon quarries and its use here is one of the very few outside North Wales. Penmon Marble is actually a limestone which is quarried from Penmon Point on the northeast tip of Anglesey. It comes from the Loggerheads Limestone Formation of the Lower Carboniferous (Asbian) Clwyd Limestone Group. These are platform and ramp carbonates, which contain shoals of reef deposits, and fossils are frequently observed in this building; solitary rugose corals include *Dibunophyllum* sp. and *Palaeosmilia* sp. as well as colonial corals of *Syringopora* sp. Large, thick-shelled brachiopods, *Daviesiella llangollensis* are also common. The limestone also shows evidence of bioturbation and is often nodular. Stylolites are also common.



Dibunophyllum sp. coral (left) and *Daviesiella* brachiopod in the Penmon Limestone of the Town Hall.

The lowermost ten or so foundation courses of the Town Hall, forming the podium, are in rusticated 'quarry dressed' blocks with smooth, well dressed masonry above. The building was restored during 2002-2008 with stone sourced from the original quarries. These new, fresh-cut blocks are clearly visible in several places around the building.

At the time of writing, Chamberlain Square, behind the Town Hall and in front of the Museum and Art Gallery was undergoing major redevelopment. However of geological interest here is the Victorian Fountain which will be preserved in the new plans for this area.

Chamberlain Square Fountain

Chamberlain Square is named after Joseph Chamberlain (1836-1914), a Liberal politician who began his career as Mayor of Birmingham and then went on to be a Member of Parliament in 1886 in the local St Paul's Ward. Chamberlain became an influential politician and is also the father of the Prime Minister Neville Chamberlain. The delightful, 20 m tall, Gothic spire which is the Chamberlain Memorial was erected in 1880 to honour Chamberlain's public service to the city, and funded by public commission. The monument was designed by namesake, but no relation, John Henry Chamberlain, a follower of John Ruskin and a great promoter of the Gothic Style. The memorial is of **Portland Stone**, the variety called Basebed, thought to be the finest quality of Portland Stone. Although relatively free of fossils, Basebed is slightly less well resistant to weathering and erosion than the more commonly used variety Whitbed. Nevertheless it is the best stone for taking the fine carving as shown here. Portland stone will be described in more detail in Part 2 of these building stones tours of Birmingham.

The plaque bearing the dedicatory inscription is in a fine piece of coarse-grained red granite, the large brick-red feldspars give this stone its distinct colour. Such granites are sourced from the Kalmar Coast of Sweden and are known as the '**Coastal Red Granites**'. They are derived from a series of 1400 million year old plutons intruded into the Transcandinavian Igneous Belt, part of a major Proterozoic mountain-building

phase. The delicate glass mosaics, depicting wild flowers, are by the famous Venetian glass makers and mosaicists, Salviati and Co.

Turn now to the large complex of buildings housing the council house and the Birmingham Museum and Art Gallery (below).



Birmingham Museum and Art Gallery & Council House

The architect of this suitably impressive civic palace, with its giant Corinthian columns and rusticated walls, was the equally impressively named Yeoville Thomason. The Council House was built between 1874-9 and the Museum and Art Gallery added in 1881-5, following a bequest of paintings from local businessmen, the Tangye Brothers. According to Foster (2007), the Council House and adjacent buildings are built from Coxbench, 'Wrexham' and Darley Dale Sandstones, all are Upper Carboniferous sandstones. All three sandstones look incredibly similar and are hard to differentiate when seen out of their geological contexts. All are buff-coloured, quartz-rich, fluvial sandstones, medium to fine-grained and are variably micaceous and cross-bedded.

'Wrexham Stone' probably refers to **Cefn Stone** quarried at nearby Ruabon in Denbighshire (Clwyd). This was a popular stone, widely used for civic architecture in North Wales, the Midlands and the North West of England during the later 19th Century. It is derived from sandstones within the Upper Carboniferous Coal Measures of the North Wales coal field.

Coxbench Stone is from Horsley Castle, Derbyshire. It is a buff-coloured, medium-grained sandstone from the Rough Rock of the Rossendale Formation of the Millstone Grit. Like Cefn Stone it is not well known these days, but was widely used as a building stone in the Midlands and as well as here in Birmingham, it was the main stone used in the construction of Derby.

Darley Dale Stone is more properly called Halldale Stone. Halldale Quarry is situated in Hall Moor Wood, just above the village of Darley Dale where the stone is extracted from a down-faulted outlier of Ashover Grit. The Ashover Grit of the Millstone Grit Supergroup outcrops widely through Derbyshire and

surrounding areas and is quarried in many localities, however Darley Dale stone was well known for its homogeneity and durability. The stone was worked here throughout the 18th and 19th Centuries until the quarry closed in the 1960s, however the site was purchased and the quarry reopened by Stancliffe Quarries Ltd. in 1984. Like the rest of the Millstone Grit Group, the Ashover Grits are Upper Carboniferous fluvial sandstones. The strength and homogeneity of this stone give it good properties for carving and it has been used on the Council House for the foliage on the cornices.

The interiors of the Museum and the Council House feature an impressive range of **Devon Marbles**, arguably the UK's most important decorative stone, but sadly no longer worked. The marbles in the interior of the museum, which is readily accessible to the public, have been described in some detail by Walkden (2015b), and the stones he describes are also well illustrated in Walkden (2015a). In British geology the Devonian period is usually associated with red sandstones, deposited in an arid environment, however in the type area of Devon, Devonian strata include a series of reefal limestones, deposited in shallow marine conditions and including fossils of corals, stromatoporoids, crinoids and orthoceras. These were slightly metamorphosed, weakly deformed and stained with iron oxides, to produce the decorative stones we see today. The varieties Red Ogwell, Red Ipplepen, Pink Petitor and dark grey Ashburton Marble are used in the museum. Similar stones are used in the interior of the Council House, though this building is not normally open to the public.

Below the Council House, the sloping Victoria Square has been landscaped and features fountains and sculpture.



One of Dhruva Mistry's Guardians, with Victoria Square House behind.

Victoria Square

The landscaping and sculptures in Victoria square are the creation of sculptor Dhruva Mistry and were installed between 1992 and 1994. Four pieces of art come together in this installation, which are entitled 'The River', 'Guardians', 'Youth' and 'Object (Variations)'. The pools and their rims associated with the

sculptures 'The River' and 'Youth' are in **Watts Cliffe Sandstone**, as are very possibly, the stone balls around the higher end of the square. Watts Cliffe stone is extracted from Elton in Derbyshire and is a unit of the Upper Carboniferous Millstone Grit Group. It was supplied for this project by the quarry owners, Realstone.

Darley Dale Sandstone is used for 'The Guardians' and the symbolic building forms 'Object (Variations)'; this stone was chosen in keeping with the Council House above. The finely honed finish on the Guardians and the fantastical building-like obelisks reveal the composition and textures of this grit stone; yellowish-brown in colour, it is composed of sub-rounded quartz grains.

Pass by Antony Gormley's imposing and instantly attributable Iron: Man (1993), down to Victoria Square House, on the corner with Pinfold Street.

Victoria Square House

At the lower end of Victoria Square is Victoria Square House, another building in Upper Carboniferous sandstone, again quite possibly one of the building stones from the Millstone Grit. It was a disliked building and described at the time of its completion in 1891 as 'coarse and commonplace', ornamented with 'pots and tea-urns' in *The Builder* magazine. The responsible architect was Sir Henry Tanner. This again is built from a quartz-rich, fine-medium grained stone, but with flecks of white mica which reflect the light. Around the doorway are columns of grey granite and this stone is also used for the soffits of the main doorway. The 'tea-urns' are above the door on Victoria Square. The exact provenance of this stone is unknown, but this is possibly **Bessbrook Granite**, a Late Caledonian granite from the Newry Granodiorite complex in County Armagh, Ireland. The larger crystals are plagioclase, and the groundmass is plagioclase, microcline, quartz biotite and hornblende.

From Victoria Square, cross the pedestrianized end of New Street to Waterloo house, filling the block between New Street and Waterloo Street.

Waterloo House

Waterloo House is situated along the east side of the square on the corner with New Street. The original building dates from the 1920s, but the granite cladding which we will now examine was added in the 1970s. The lower floor is now a branch of the Halifax building society (entrance on New Street) and has been clad in relatively recent times with a dark red granite called **Dakota Mahogany**. This is an ancient stone, 2.7 billion years old. It is quarried in Millbank, South Dakota in the USA. This stone has been quarried since the 1920s but has become a globally important building stone since the 1950s and it is commonly seen as cladding on many modern office blocks and shop fronts throughout the world. The orange-red colour is imparted by potassic feldspars which have a perthitic texture, but looking closely, there is also grey blue, opalescent quartz and the black minerals are biotite and hornblende.

The entrance to Waterloo House on Waterloo Street is also paved with an ancient stone, but a youngster compared to Dakota Mahogany. This is a variety of 1.5 billion year old Rapakivi Granite called by geologists wiborgite and by stone marketers as **Baltic Brown**. Texturally it contains distinctive 'ovoids' of pink potassic feldspar, rimmed by green plagioclase. The groundmass is of dark brown smoky quartz, hornblende and biotite. Like Dakota Mahogany, Baltic Brown is one of the world's most recognisable building stones. It is quarried in eastern Finland, close to the border with Russia. The huge Vyborg Batholith, in which there are many quarries for this stone, straddles the border.

Next door along Waterloo Street is New Oxford House.

New Oxford House

New Oxford House comprises an entrance to the office block and Adam's Restaurant next door. This is an Art Deco building completed in 1936 by the architect S. N. Cooke (who had also co-designed the Hall of Memory in Centenary Square). The entrance to the offices on the upper storeys is flanked with two stone door jambs with unusual carvings of heads. These are by the sculptor William Bloye.

The building is constructed from a pale grey limestone packed with crinoid fragments which appear as small circular fossils, called ossicles, and longitudinal sections of stacked stems of ossicles. The individual ossicles resemble sequins. A few fossil brachiopods are present and distinctive by their thick-walled, white shells, forming ring-like features. These are from the Lower Carboniferous Eyam and Monsal Dale Limestones of Cromford in Derbyshire and were marketed under the name **Bird's Eye Marbles** (below).



Portland Stone, the variety known as Whitbed is also used here; it is distinguished from the Derbyshire stone by the absence of crinoids and the presence of oyster shells. These weather out slightly from the pale grey, oolitic limestone matrix. Portland Stone is uppermost Jurassic in age and quarried from opencast and underground quarries on the Isle of Portland in Dorset.

The engaged columns between the windows of Adam's Restaurant next door are of a green serpentinite breccia. This is a variety of **Verde Alpi**, a generic name applied to serpentinites extracted from the Piedmont Zone of the French and Italian Alps; many come from the suite of Combin and Zermat-Saas ophiolites. These serpentinites represent slivers of ancient oceanic crust which were overthrust (obducted) onto land during the closing of the Tethys Ocean, during the formation of the Alps in the Cretaceous. Pyroxene and olivine-rich oceanic crust has undergone a metamorphism to produce the serpentine group minerals. Crystallographically these are larger than their precursor and therefore serpentinisation is accompanied by a volumetric expansion of the rocks – hence the brecciation. The white veins that formed at this time are infilled with calcite. Looking at the contiguous blocks of serpentinite, they can be seen to be studded with crystals around 5 mm diameter. These are 'bastites', pseudomorphs of pyroxene replaced by talc and tremolite. They have a slightly bronzy appearance. The presence of bastite tells us that this serpentinite represents the upper 'igneous' section of oceanic lithosphere. The slightly reddened appearance of some of these slabs is the consequence of oxidation, indicating that this serpentinite was perhaps exposed on the seafloor prior to obduction.

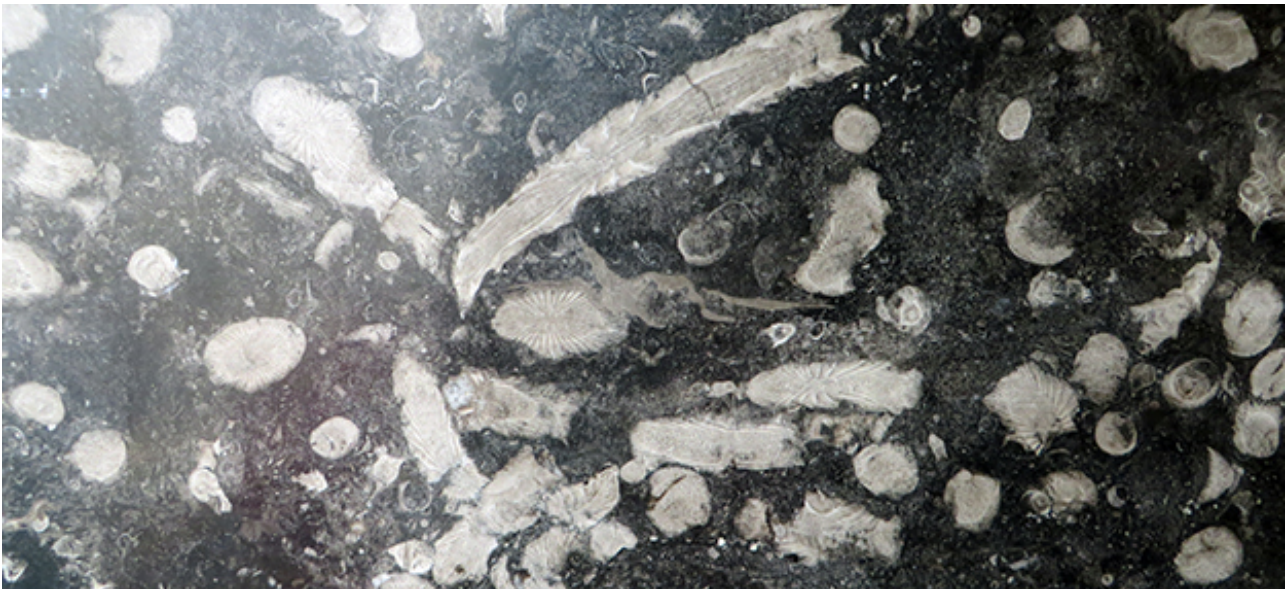
Return to Victoria Square and walk up (right) and then turn right onto Colmore Row. The first building of note is on the south side and is currently a coffee shop which may make a welcome pit stop on this walk.

Lawson Java Lounge Coffee Shop, Colmore Row

This Grade I listed building was formerly the Eagle Insurance Offices, designed by the influential Arts and Crafts architects William Lethaby and Joseph Lancaster Ball. It was completed in 1900. For urban geologists, the main points of interest here are the black and white 'marbles' in the soffits of the doorways of 122-124 Colmore Row. Number 124 has been converted into a coffee bar and café. This is **Frosterley**

Marble, one of Britain's great decorative stones. It is not a true marble but it takes a good polish and has been used since the Mediaeval Period, especially for ecclesiastical fittings, many good examples can be seen in the great churches of the North of England including Durham Cathedral and York Minster. Its use had declined, but the revival in interest in decorative stones in the later 19th and early 20th centuries brought Frosterley marble back into fashion, and this coffee bar at 122-124 Colmore Row is a rare example of its use on the exterior of a building. The stone is composed of white corals; the species are the rugose corals *Dibunophyllum bipartum* which are set in a black, bituminous limestone matrix. Frosterley Marble occurs as narrow lenses, less than a metre thick, in the Great Limestone Member of the Alston block and it is quarried at Harehope and Broadwood Quarries, near the village of Frosterley in Weardale, County Durham.

The Lawson Java Lounge makes a good place to stop and refuel. The interior is also of geological interest with fine panels of book-matched slabs of **Connemara Marble** in frames of a buff limestone (possibly Hopton Wood Stone) around the upper walls. Connemara is a true marble, or more properly an 'ophicalcite'. These are metamorphosed limestones which also contain a high proportion of the serpentine group minerals as well as tremolite, forsterite and diopside. These stones are quarried from numerous workings around Clifden in County Galway, Ireland. The protoliths of these stones were Dalradian sediments which subsequently underwent metamorphism during the Caledonian Orogeny.



Dibunophyllum sp. corals in Frosterley Marble at 122-124 Colmore Row.

Starbucks, and 125 Colmore Row

A large, post-modern style office block, also housing Starbucks Coffee shop, is situated at 125 Colmore Row. The main structure is clad in a yellow-coloured synthetic stone but the foundations are clad in a garnet-bearing metagranite called **Giallo Cecilia**. This is one of several decorative stones quarried from a suite of igneous rocks in the state of Espirito Santo, Brazil. Five suites of granite emplacement have been recognised in this terrane, known as the Carlos Chagas Suite, with the older phases of activity having become progressively deformed; Giallo Cecilia is from the second intrusive suite. They were intruded between 630-480 Ma during the Neoproterozoic-Cambrian Aracuai Orogeny. Granites quarried from these plutons have been subjected to tropical chemical weathering in their upper portions which has stained them with goethite, hence their trade names having the prefix '*giallo*' (Italian for yellow). The rock is composed of orthoclase, quartz, plagioclase, biotite and garnet and shows a strong foliation, with even some of the garnet porphyroblasts having been sheared through. The garnets are large and red, up to 1 cm in diameter.

115 Colmore Row

Next door is 115 Colmore Row also built in a post-modern style with a yellow granite used for the foundations. This is **Giallo Dorata** (also known as Golden Carioca), another 'giallo' granite from the Carlos Chagas Suite of Espirito Santo in Brazil (see 125, Colmore Row above). This stone is from the latest suite of intrusions in this region, emplaced in the early Cambrian. The stone is extracted from the Medina-Pedro Azul Pluton, which is also worked for its gem quality topaz-aquamarine pegmatites. This stone contains orthoclase, plagioclase, quartz and biotite. Orthoclase is also present in euhedral, zoned megacrysts, several centimetres in length.



Zoned feldspars in Giallo Dorata granite at 115 Colmore Row.

Though superficially similar in appearance to the synthetic cladding of 125 Colmore Row, number 115 is clad with **Bath Stone**. Like Portland Stone, Bath Stone is an oolitic limestone, the ooids often weathering in on the surface, however although it is Jurassic in age it is older than the Portland limestones. This variety, also containing small, fossil echinoids (sea urchins) is Oxfordian in age and is specifically a variety of Bath Stone called Coombe Down Stone. The sections through echinoids resemble slices through mushrooms. Distinctively, it contains fine, discontinuous, calcite-cemented 'stringers' known as 'watermarks' which are particularly obvious in this example.

110 Colmore Row

This building was erected for the Scottish Union and National Insurance Company by architects Henman & Cooper in 1904. Fittingly the main stones featuring here are Scottish granites. The pink granite on the foundations is **Peterhead Granite** from Stirlinghill on the coast north of Aberdeen. This stone will be further described when it is more easily observed in the Cathedral yard (below). Above this, the first storey is clad in a pale-grey, two-mica granite, which may well be **Dalbeattie Granite** from the Southern Uplands.

The West Bromwich Building Society

The West Bromwich Building Society stands on the corner of Colmore Row and Bennetts Hill. The main building stone is a rather grubby Portland Whitbed. However the foundations and door-surround are clad in larvikite, Norway's National Stone. This is the variety of this stone marketed as **Marina Pearl Larvikite** and it is composed of perthitic feldspars (a mixture of plagioclase and orthoclase) which have a pearlescent shimmer. This optical phenomenon is known as schillerescence in feldspars and the varieties of larvikite show it off to a good effect. Also present is the feldspathoid mineral nepheline and dark-coloured (mafic) minerals are biotite, magnetite and the pyroxene variety titanite. The stone is sourced from a large,

multiple intrusion near the town of Larvik in the Vestfold region on the south coast of Norway. These plutonic rocks were emplaced during extension in the Oslo Graben at 290 Ma. They have been quarried commercially since the 1880s and have become hugely popular world wide ever since.

On the opposite side of the road is 85-89 Colmore Row, now occupied by an art dealer's and an estate agent's offices.

85-89 Colmore Row

This grand-looking building stands on the corner of Newhall Street and Colmore Row, built in the 'Florentine Renaissance' style; this is another building designed by Yeoville Thomason (of Council House fame) dating from 1869 and modified in 1885. This is built from a buff-yellow to pale brown, cross-bedded sandstone, which is probably **Coxbench** or **Darley Dale Sandstone** or a similar Upper Carboniferous sandstone, as used at the Museum, Council House and in Victoria Square.



Marina Pearl larvikite on the West Bromwich Building Society.

Continue along the north side of Colmore Row.

Royal Bank of Scotland, 79-83 Colmore Row

This building also appearing generically yellow in sunlight is clad in **Bath Stone**. However, look carefully as some areas have been patched with a yellowish concrete, rich in a sharp quartz sand aggregate. This can be mistaken for a sandstone. The true Bath Stone is an oolitic limestone and the spherical ooids can be seen on the surface, weathering in as ovoid or circular, tiny, pits. These are just visible to the naked eye and are easily seen with a hand lens. Finely comminuted shell fragments are also present. The yellow colour, imparted by traces of the iron oxide hydroxide mineral goethite and the way the ooids weather in as pits, distinguishes Bath Stone from Portland Stone. Nevertheless both are Jurassic oolites formed in the subtropical seas that dominated western Europe during the Jurassic. Bath Stone is quarried from underground workings from the Middle Jurassic (Oxfordian) Chalfield Oolite Formation.

This is a very decorative building with roundels depicting the Italian Renaissance goldsmiths Cellini and Ghiberti (the original owner, William Spurrier, sold silver and gold plate), vases and swags of flowers, Corinthian columns and capitals and rusticated stonework. It was designed by J. A. Chatwin and completed in 1873.

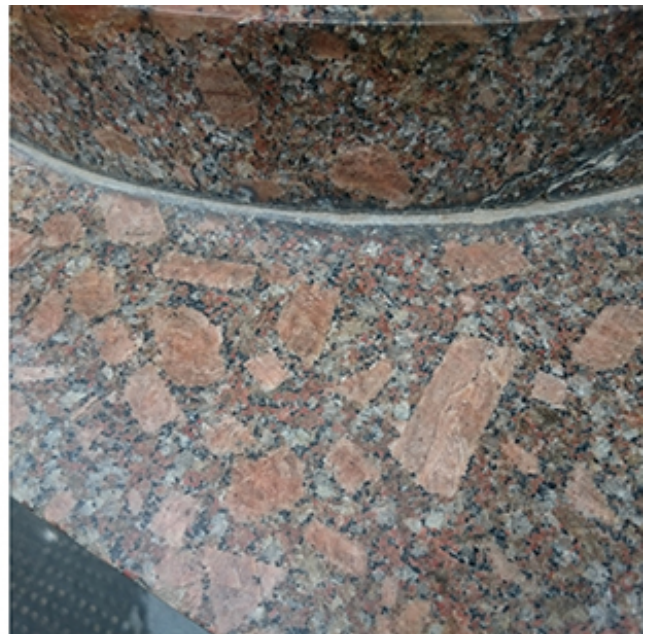
84 Colmore Row

Across the road, 84 Colmore Row again is built with a grubby **Portland Stone** on its rusticated and moulded upper storeys. The heavy foundation courses are of a grey, foliated granite. This is one of the Scottish Grampian granites and is almost certainly **Dancing Cairns Granite** quarried from the 470 Ma Aberdeen Pluton. The quarry, now filled in and occupied by a golf course, was at Bucksburn Howe and it operated throughout the latter half of the 18th Century until the 1960s. Dancing Cairns is a two-mica granite, and the silvery muscovite flakes can be seen here, catching the sunlight. The black biotite is aligned and concentrated in small 'books'. Quartz and feldspar are also present.

A large block was undergoing reconstruction at the time of the writing of this guide, so we move along Colmore Row, past the Cathedral (to which we will return shortly) to what was once the Grand Hotel on the corner with Church Street, which too has been recently refurbished.

The Grand Hotel (now Gusto Restaurant), Colmore Row

The Grand Hotel was built in 1878 by architect Thomas Plevins. The lower storey is rendered and it is probably Portland Stone Whitbed above and around the doorway (both inaccessible at the time of writing). Of great interest however are the unusual granite columns supporting the porch. On each side there are twin columns standing on a single plinth with an ovoid section. These were probably added to the façade in 1890 during a refurbishment by Martin & Chamberlain. The columns are splendid examples of **Shap Granite**. This is the 'dark' variety with a rich red-brown matrix and prominent, euhedral phenocrysts of pink, potassic feldspar. Shap Granite comes from Shap Fell in the Lake District. It is a late Caledonian granite, intruded at 397 Ma into the Borrowdale Volcanics Group and the overlying Windermere Group. Some evidence of the country rock is seen in the dark, rounded xenoliths, known as 'heathens' to the quarrymen and stonemasons. Examples of these can be seen as dark grey patches on the columns.



Shap Granite at Gusto Restaurant.

Walk to the end of the block, at the corner of Colmore Row with Livery Street. Another modern building is occupied by Barclays Bank and Jamie Oliver's Fifteen restaurant.

Barclays, 15 Colmore Row

A yellow, calcarenitic facies of **Bath Stone** is also used to clad this building. Close inspection with a hand lens shows the rock to be composed of finely comminuted shell fragments as well as ooids. However the steps are of a pink granite, possibly a variety from Sardinia or from northwestern Spain. Further research would be required to confirm the origin of this stone. It is composed of pink-orange potassic feldspars, white plagioclase, greyish quartz and black biotite.

Cathedral Church of Saint Philip

The Church was designed and built by Thomas Archer, a rare and well-executed example of 'English Baroque'. Initial building works were completed in 1715, with the tower added in 1725. Thomas Archer and his brother Andrew were local gentry and landowners who initially supplied the stone from quarries on their own land. This was **Arden Sandstone** from Rowington Quarries which decayed rapidly. Refacing the Cathedral began in 1859, and now all the exterior stone was put in place in the 19th and 20th Centuries. The stone used is a variety of buff to white-coloured sandstones from Derbyshire and the Midlands; these include **Darley Dale Sandstone** as described above, **White Mansfield Stone**, **White Hollington Stone** and **Dunhouse Stone** (Jones, 2011). However, as at the Council House, distinguishing these stones on the building is no easy task. White Hollington Stone is a buff coloured sandstone from the Triassic strata of Staffordshire, part of the Sherwood Sandstone Group. It is still produced from Tearne's Quarry near the village of Hollington. Dunhouse Sandstone is another buff sandstone from the Millstone Grit Group, but this time from Cleatlam, County Durham. Both these sandstones are quartz arenites with flecks of mica.



White Mansfield Stone from the Permian Magnesian Limestone should be more recognisable, being an oolitic limestone, but nevertheless a calcarenite with crossbedding, which can be indistinguishable from a sandstone at distance. However, it should weather a pale yellow or grey. The stone is no longer quarried. The unit from which it came, the Cadeby Formation, outcrops from the East Midlands up through Yorkshire

to the coast of County Durham. It has been quarried all along the strike. The quarries in Mansfield, which produced a fine variety of this stone, were in the town centre, on Quarry Lane.

Much of the Cathedral Churchyard ceased taking burials in 1848 and became a park. Three prominent memorials are of geological interest.

Crimean War Memorial Obelisk

This red granite obelisk was designed to commemorate the Crimean War and also Lieutenant Colonel Unett who was killed at Sebastopol. Thomas Unett was born in Handsworth and christened in St Philip's. The monument was probably installed soon after Unett's death in 1856. The Memorial is constructed of **Peterhead Granite**, quite possibly the most popular stones for monuments used in the Victorian Period. It is a distinctive medium- to coarse-grained, pink granite with grey, smoky quartz, pink feldspars, hornblende and biotite. It commonly contains rounded enclaves of a dioritic, mafic igneous rock. Peterhead Granite is quarried from Stirlinghill to the north of Aberdeen, on the coast. The quarries were in operation for around two hundred years, finally closing in 1956. The Peterhead Pluton was intruded towards the end of the Caledonian Orogeny at around 406 Ma.

Burnaby Obelisk



An obelisk stands in the Cathedral graveyard, inscribed only with the name Burnaby, Khiva 1876 and Abu Klea 1885. There are few clues as to who Burnaby was for the modern viewer, but he was famous in his day as a soldier, adventurer and general all-round hero. Frederick Gustavus Burnaby (1842-1885) was born the son of a Bedfordshire parson but went on to be the stuff that Victorian adventure stories were made of. His links to Birmingham are somewhat tenuous. He stood unsuccessfully for a seat in Parliament in the 1880s. His most famous exploit was a trip on horseback over 3000 miles of Central Asia to Khiva. He later served in the Desert Column sent to relieve General Gordon at Khartoum and died fighting the forces of the Mahdi at Abu Klea in

1885. The portrait in marble set on the south side of the obelisk makes him look far more like Joe Stalin than the young officer in James Tissot's portrait painted in 1970 which is the epitome of 'dashing'. It is in the National Portrait Gallery (NPG 2642, above). This monument was erected following Burnaby's death in 1885 and designed by Robert Bridgeman of Lichfield. The obelisk and plinth block with the inscriptions and portrait roundel are in **Portland Stone**, with oyster shell fragments weathering out. The lower part of the plinth and steps are in a grey crinoidal limestone. Close inspection shows it to be packed with crinoid fragments, but there are also some nice examples of corals and brachiopod shell fragments too. This is probably one of the crinoidal **Bird's Eye Marble** limestones from Derbyshire, but these stones are notoriously difficult to source. Nevertheless the Lower Carboniferous Eyam Limestones were widely quarried in places including the quarries around Wirksworth (i.e. Cromford and Middleton) and around Monyash. These were formed as predominantly crinoid reefs on the



Derbyshire Carbonate Platform. **Carrara Marble** has been used for Burnaby's portrait roundel (previous page). The stone is slightly streaked with grey suggesting that it is Carrara Sicilian Marble, one of the huge varieties of stones available in the Carrara region of Tuscany (note that there are no links with this stone to the Island of Sicily!). Sicilian and similar varieties were excellent for sculpture, not having a strong schistosity. The marbles are sourced from the Alpi Apuane of the Northern Apennines. This unit is a tectonic window revealing Triassic-Jurassic limestones which underwent metamorphism at greenschist facies during the formation of the Alps (and the Apennines) during Upper Oligocene to early Miocene.

Walk towards the eastern end of the Cathedral Churchyard and a small monument in the form of a column drum.

Monument to John Heap and William Badger

Heap and Badger were builders working on the construction of Birmingham Town Hall and they were both killed whilst working on the construction in 1833. Their monument here is the curtailed shaft of a fluted column, modelled on those used at the Town Hall, and like the Town Hall itself this monument is constructed from **Penmon Marble** from Anglesey.

The Cathedral churchyard is the final stop on this walking tour. The southern side of Cathedral Yard, Temple Row, will be covered in a subsequent urban geological walking tour of Birmingham's city centre.

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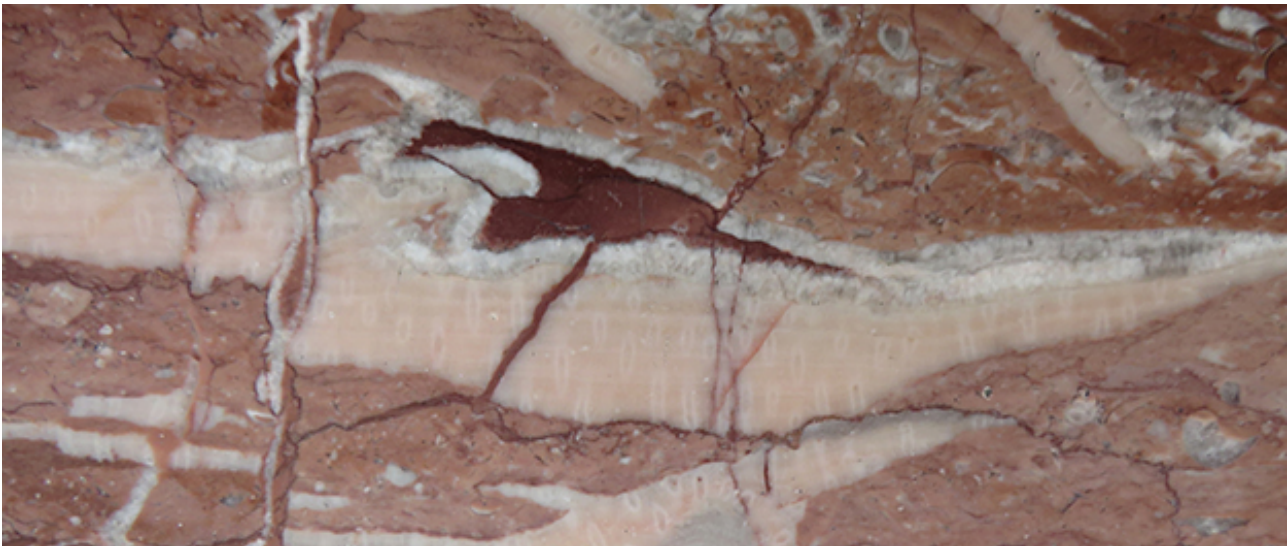
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Red Ipplepen Devon Marble in the Museum & Art Gallery foyer; field of view is ~15 cm.

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