

Trail 1: The Town Hall to the Cathedral Square

This walk explores the building stones used in the magnificent civic buildings at the heart of the City of Birmingham. From the classical-style 19th century Town Hall we go on an architectural tour of the last 200 years. It will bring you face to face with fossils over 300 million years old, and you will gaze 2700 million years back into the abyss of time! This is the first of three trail leaflets for the Building Stones of Birmingham City Centre.

The trail is about $\frac{3}{4}$ mile long (1.3km).

Do you want to know more?


Have a look at the extended web version of this trail, with more building stones to look at, more photos and more geological and historical information.

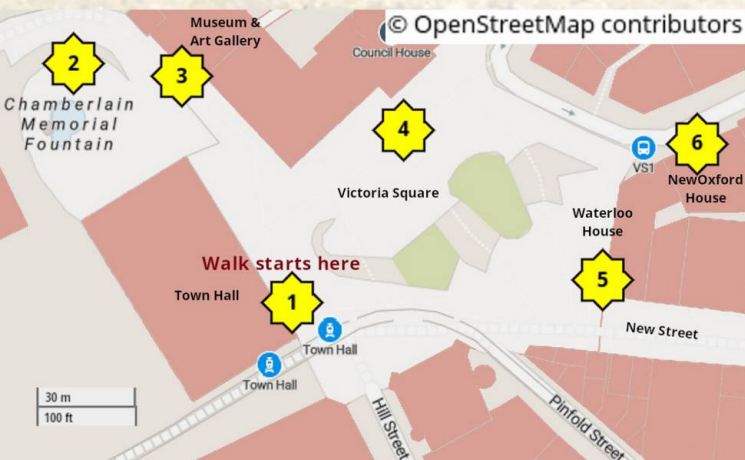
(Details are on the back page.)

Start the walk at the front of Town Hall in Victoria Square.

1. Town Hall

Birmingham Town Hall is built from brick, but clad with Penmon Marble, a fossiliferous limestone from Anglesey which formed during the Carboniferous period around 340Ma (million years ago). The land that was to become Britain lay just south of the equator and this stone formed in warm, shallow seas abundant in coral reefs and shellfish. *(See box on Sedimentary Rocks.)*

 Fossils are plentiful in the rough-hewn limestone blocks at the base of the building. Look for the solitary coral '*Dibunophyllum*' with a cross-section like the spokes of a bicycle wheel. Brachiopods (bivalve shellfish) stand out, and a closer look may reveal some examples of a colonial coral *(see front cover photo detail)*.



Brachiopod in the Town Hall


The Town Hall originally opened in 1834 and was restored during 2002-2008 with stone sourced from the original quarries in Anglesey. These new, freshly-cut blocks are clearly visible in several places around the building.

With the Town Hall on your left, walk a short distance to the centre of Chamberlain Square.

2. Chamberlain Square

The Square re-opened in 2021 after major refurbishment, but the focal point remains the Gothic-style memorial and fountain erected in 1880 to honour Joseph Chamberlain. It is made of Portland Stone, a limestone of Jurassic age (around 150Ma), from the Isle of Portland in Dorset. Here the Basebed variety is used. This is regarded as the finest for carving though is less resistant to weathering than the more common Whitbed variety, which is used for the coping stones around the pools. *(See Trail 2 for more on Portland Stone)*. The monument was renovated in 1978, with the pools walled in a light-grey granite. This is from one of many granite quarries in Aberdeenshire, most likely Kemnay to the NW of Aberdeen. *(See box on Igneous Rocks.)* These granites were intruded around 470Ma during the Caledonian Orogeny (mountain building) which lasted from around 490-390Ma. Tectonic earth movements caused continents to collide, giving rise to a mountain range comparable with the modern Himalayas.

The dedicatory plaque is a coarse-grained granite with large red feldspar crystals. It is around 1400Ma and comes from the Kalmar coast of SE Sweden.

 Look closely at the Portland Stone and you will see tiny spherical grains indicating that it has an 'oolitic' texture *(more details at stop 9)*. Note the extent of weathering in parts of the Portland Stone, with two buttresses restored in the more robust light-grey Aberdeenshire granite. This has small angular crystals of




Chamberlain Square

Sedimentary Rocks

Sedimentary rocks are made of particles and fragments which have accumulated over time and gradually been compressed and cemented into rock, usually showing distinct layers or beds which we can see in exposed surfaces and building stones. **Sandstones** are sedimentary rocks formed when silt, sand and small particles have been carried by rivers to settle in lakes or in the sea, or blown by the wind to form desert sand dunes. Cross-bedding is a common sedimentary feature, formed when the water flow or wind changes direction, causing the sediment to be deposited at an angle to the previous deposits. **Limestones** are sedimentary rocks made largely of the mineral calcite which is mostly produced by biological activity. Calcite shells and skeletons are gradually broken down by wave-activity, but large fragments and whole specimens may be preserved as distinct fossils. There are many examples in the limestones seen on these three trails.

biotite. On top of the wall note the dense clusters of typical Portland Whitbed fossils, mainly oyster shells.

The paving around the monument is a sandstone known in the trade as York Stone. *(See box on Sedimentary Rocks.)* It formed from sandy sediments washed down from mountains to form massive river deltas during the Carboniferous period around 320Ma. It comes in many varieties from numerous quarries in and around Yorkshire. This robust variety comes from Scout Moor near Bury, Greater Manchester.

 Note the colourful concentric lines in many of the paving stones. This is called Liesegang banding, a form of staining produced from circulating ground water percolating through the rock.

The 2020-21 refurbishment also brought two foreign granites to the square. The lighter one with prominent white rectangular-shaped feldspar crystals is known in the trade as Alpendurada and comes from NW Portugal. This is used in the steps and seating. The variegated yellow granite almost certainly comes from Fujian province in China, the source of much of the more recent paving found on these trails. This stone paves the rest of Chamberlain Square, and extends into Victoria Square.

Turn to the complex of buildings housing the imposing clock tower and the Museum & Art Gallery.

3. Birmingham Museum & Art Gallery - Interior

The fabric of the building is part of the Council House (see below), but if the Museum & Art Gallery is open, have a look inside at the impressive range of decorative coloured stones. These are Devonshire Marbles, from quarries around Torquay in Devonshire, and are really limestones, not marble. (See box on Metamorphic Rocks.) They date from the Devonian period around 390Ma.



Orthocone fossil in the Museum & Art Gallery

There are numerous fragments of corals, and several 'orthocones', the shells of an extinct straight-shelled nautiloid. There is a spectacular example in the left doorway into the Edwardian Tearoom. On your way out, stop on the steps in the porch to admire the colourful stone paving, a metamorphic granite-migmatite of unknown origin.

Turn left out of the Museum & Art Gallery and walk to the corner at Victoria Square observing the massive stone building blocks of the Council House as you go.

4. Birmingham Council House & Victoria Square

The Council House was built between 1874-9 and the Museum and Art Gallery was added in 1881-5. They are

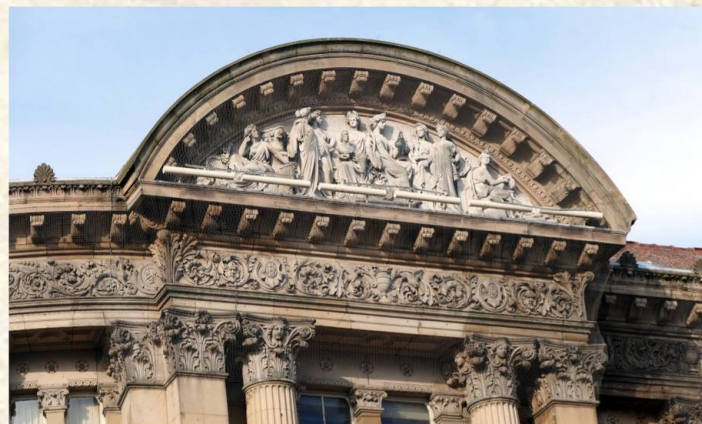
Metamorphic Rocks

Metamorphic rocks are formed when existing igneous or sedimentary rocks are subjected to pressure and heat to form a distinctly different type of rock from the original material. **Gneiss** is a common metamorphic rock formed at high temperature and pressure. It usually has a banded texture. **Migmatite** forms under similar but more extreme conditions than gneiss, causing partial melting. **Marble** is a metamorphosed limestone, in which the original carbonate sedimentary material has recrystallised, obscuring the structures and textures of the original rock. In true marble any original fossil material will be lost (e.g. Carrara marble from Italy). The term 'marble' is widely used for any carbonate stones which take a good polish, but if they contain recognisable fossils they are technically limestones, not marble (e.g. the Devonshire Marbles in the Museum & Art Gallery).

built from three similar sandstones, mainly from Derbyshire, known as the Millstone Grit. These date from the same period and environment as the York Stone (stop 2).

Look for criss-cross patterns in the massive building blocks. This is called 'cross-bedding', formed by the water flow changing direction as the sediment was deposited. The balustrade facing Victoria Square shows evidence of weathering at the base of the pillars.

Take a diagonal route across Victoria Square, looking back to admire the full extent of the Council House.



Portland Stone pediment on the Council House

Look up to see three finely carved pediments. These are made of Portland Stone, most likely the Basebed variety as used in the Chamberlain Memorial. Stop to look at the sphinx-like 'Guardians', installed between 1992 and 1994, and made of Upper Carboniferous sandstones to match the Council House.

Continue down to Waterloo House, which fills the block between New Street and Waterloo Street.

5. Waterloo House

The lower floor of Waterloo House is (in 2021) home to Nando's restaurant with the entrance on New Street.

Look closely at the cladding which was added to the building in the 1970s. Though unimpressive from a distance, a closer look reveals an attractive linear fabric and you can see individual crystals catching the light. This is a dark red granite called Dakota Mahogany, from South Dakota in the USA. Dating from 2700Ma, this is the oldest stone on this trail.

Go up the steps alongside Waterloo House, turn right into Waterloo Street, and on a few steps to New Oxford House.

6. New Oxford House

New Oxford House has a central entrance with eye-catching surrounds to the doorways of the premises on either side. The central door jambs are constructed from a pale grey limestone packed with crinoids (similar to modern sea lilies). This stone is known in the trade as Bird's Eye Marble. It is of Lower Carboniferous age (around 330Ma) and is one of the Eyam and Monsal Dale limestones from Derbyshire.

Crinoid fragments appear as small ring-shaped fossils called ossicles. Longitudinal sections of stems show stacked ossicles, some revealing the outer edge of the stem looking a bit like a screw thread. There is some coral detritus, and brachiopods are distinguished by their thick-walled shells, forming ring-like features.

The distinctive door surrounds are made from a green 'serpentine breccia' known in the trade as Verdi Alpi. It comes from the French and Italian Alps and was formed around 30Ma after the African and European tectonic plates had collided, during the period of mountain building called the Alpine Orogeny. These serpentinites represent slivers of ancient oceanic crust which were crumpled and welded onto the edge of the continental plate. The green colouring is associated with minerals in the rocks from the deep ocean crust. During the uplifting process the rocks were altered or 'metamorphosed' by the intense pressures involved. New serpentine minerals were formed, causing the rock to crack into angular fragments. This process is called brecciation. The gaps were later filled in with other minerals, notably calcite, to form the white veins around the brecciated blocks.



Serpentine breccia

Look closely at the texture of this rock and ponder on its tortuous history. Note the calcite infill and many small crystals in the serpentine blocks which are further evidence of the metamorphic processes involved in its formation.

Walk back along Waterloo Street and turn right into Colmore Row. The first building of note is on the south side and is currently a Java Lounge.

7. 122-124 Colmore Row, Java Lounge

This Grade I listed building is of particular interest for the black and white 'marble' stone flanking the doorways. This is Frosterley Marble from County Durham. It is not a true marble but a highly fossiliferous limestone, dating from the Carboniferous period around 325Ma. It has been widely used for interior decoration, and this is a rare example of its use on the exterior of a building.



Frosterley Marble

The main fossil here is the solitary coral '*Dibunophyllum*' as seen in the Town Hall, but here it catches the eye, standing out in intricate detail against the black, bituminous limestone matrix. This stone formed in a shallow tropical sea rich in organic material, very different from the conditions which supported the same coral species in the Town Hall's Penmon Marble limestone.

If you are tempted to refuel inside the Java Lounge there is another geological feast for your eyes!

On the walls there are fine panels of Connemara Marble, one showing mirror symmetry where the stone has been split and both halves mounted side by side. This is a true marble and comes from numerous workings around Clifden in County Galway, Ireland. Its green colouring is caused by a high proportion of the serpentine minerals (refer to stop 6).

Ancient sediments underwent metamorphism during a period of continental collision and mountain building known as the 'Caledonian Orogeny'. This lasted for about 100 million years, from around 490-390Ma.

Continue along the same side of Colmore Row to the junction with Bennetts Hill.

8. 98 Colmore Row

98 Colmore Row stands on the corner of Colmore Row and Bennetts Hill. The fossiliferous Portland Whitbed stone is used for the main building. This is one of the most popular stones used for civic building work all around the country. The foundations and door-surround are clad in Larvikite, an intrusive igneous rock similar to granite, from quarries near the town of Larvik in Norway. It dates from the Permian period, around 290Ma. This stone has become popular world-wide for its iridescent sheen and is widely used as an ornamental stone for interior design and as exterior cladding.



Larvikite from Norway

Note how the silver-blue shiny feldspar crystals change colour as the light reflects at different angles.

Cross and continue along Colmore Row to Nos. 79-83 (the number is engraved in glass above the door).

9. 79-83 Colmore Row

This building is clad in Bath Stone which is of mid-Jurassic age, 168Ma. It is a honey-coloured 'oolitic' limestone. Like the younger Portland Stone, it is made up of tiny egg-shaped grains called 'ooids'. These form when sediment grains are rolled around in a warm, shallow, tropical sea and gradually become coated with calcium carbonate.



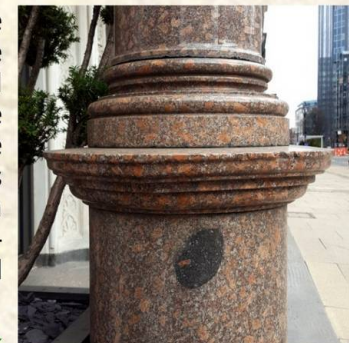
Oolitic limestone

Look for cavities left by the ooids as they weather away. These are clearly visible to the naked eye, but a magnifying glass or hand lens will reveal a texture similar to fish roe. Look out for repairs made using concrete, which has sharp sand grains unlike the round ooids.

Continue to the junction with Church Street.

10. 57 Colmore Row and the Grand Hotel

The buildings either side of Church Street are notable for their colourful pillars. These are made from Shap granite from the Lake District. This was intruded in the Devonian Period during the Caledonian orogeny around 397Ma.



A xenolith in Shap granite

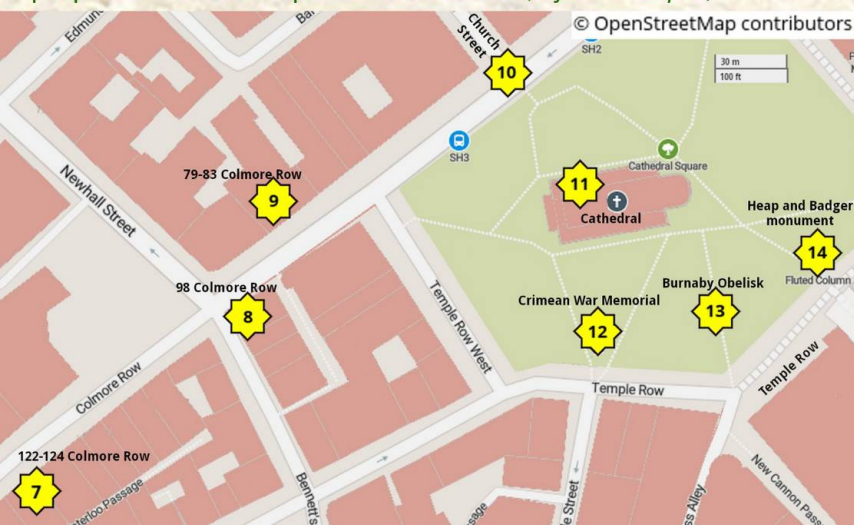
Note the large pink sub-rectangular feldspar crystals which make this stone attractive and easily recognisable. At Gusto restaurant (under the Grand Hotel), the ovoid plinths supporting the pillars have black inclusions. These are fragments of rock which fell into the granite mix and stayed intact as it solidified. They are known as xenoliths.

11. Cathedral Church of Saint Philip

The Church dates originally from 1715 - 1725, and was designed by Thomas Archer. It was built from a local stone called Arden Sandstone which unfortunately decayed rapidly. Refacing the Cathedral began in 1859, and now all the exterior stonework dates from the 19th and 20th Centuries. The stones used are a variety of buff to white-coloured sandstones from Derbyshire and the Midlands, too numerous to list here.

Igneous rocks

Igneous rocks are formed from molten material or magma which comes from deep under the Earth's surface. When the magma solidifies underground it is known as an **intrusive** igneous rock. The slower the cooling process, the larger the crystals. **Granite** is an intrusive rock showing a distinct crystal structure. Crystals of quartz, feldspar and mica (black biotite and clear, flaky muscovite) are commonly visible. The colours vary in accordance with the composition of the magma. When the magma solidifies above the surface (e.g. from a volcanic eruption) it is described as **extrusive**. Exposed to the air the magma will cool more rapidly, resulting in smaller crystal sizes, e.g. **basalt**. Geologists divide igneous rocks into many categories, but in the building trade they all tend to be grouped together as granite. The three trails cover a wide variety of building stones of igneous origin.





Cathedral Church of Saint Philip

Look for varying grain size and small pebbles, and for sandstone features such as cross-bedding, as seen at the Council House in Victoria Square.

12. Crimean War Memorial, Cathedral Square

This obelisk is made of red Peterhead Granite from Stirling Hill in Aberdeenshire. It was one of the most popular monumental stones in Victorian times. At 406Ma, this granite belongs to the later stages of the Caledonian Orogeny in the Devonian Period.

Look closely to distinguish the wide variety of colours and sizes in the mineral composition, and note the presence of small xenoliths.

13. Burnaby Obelisk

The white obelisk in the graveyard is a monument to a once famous soldier. The obelisk and its plinth are in the now familiar Portland Whitbed Stone. The lower part of the plinth and the steps are made from Bird's Eye Marble (as described at stop 6).

Look for oyster shell fragments weathering out of the Portland stone, and in the Bird's Eye Marble you can find brachiopods and crinoids amidst the shell debris.



Burnaby Obelisk



Bird's Eye Marble, the lower plinth of the Burnaby Obelisk

Carrara Marble has been used for the portrait roundel. This is a true marble from the Carrara region of Tuscany in Italy. It has been famous for sculpture and monumental work from Greek and Roman times to the present day, due to its even texture and almost white colouring. These marbles formed from earlier limestones, which were compressed and uplifted during the Alpine orogeny around 30Ma.

Close to the Burnaby Obelisk is a small monument in the form of a column drum.

14. Monument to John Heap and William Badger

Heap and Badger were builders working on the construction of Birmingham Town Hall in 1833, when a pedestal fell and killed them both. Their monument here is the curtailed shaft of a fluted column, modelled on those used at the Town Hall, and constructed from the same fossiliferous Penmon Marble limestone. It is a focus for International Workers Day on 1st May each year, and poignantly links together the start and finish of this trail.



Monument to John Heap and William Badger

We hope you have enjoyed it.

Trails 2 and 3 explore more geological secrets hidden in the buildings of Birmingham. These three trail leaflets and the fuller versions of all the trails (Siddall, R., et al., 2016) can be found on the Black Country Geological Society's website at: https://bcgs.info. Produced by members of the BCGS. © Black Country Geological Society, 2021.



Building Stones of Birmingham

A three part tour telling stories of the stones which built the city

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Take a closer look at Birmingham's buildings and travel back into the depths of geological time!