

Building Stones of Nottingham

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Abstract. The great variety of natural stone materials used on buildings in Nottingham, mainly as shop-front cladding, are described along two walks around the city centre.

Nottingham, like many other modern cities, has numerous buildings made of, decorated with, or faced in a great variety of natural stone materials. The stones used vary with the ages of the buildings, with locally sourced varieties dominating before the early part of the 19th century, and later a selection of stones from elsewhere in Britain. Today, Nottingham, like any other dynamic city centre, is characterised by architecture that uses stones from all over the world. Together these changes provide a splendid slice of urban geology that more than compensates for the almost complete lack of exposed bedrock. Nottingham also benefited from the distinctive design work of two local architects, Thomas C. Hine (1813-1899) and Watson Fothergill (1841-1928), whose buildings still dominate parts of the cityscape.

Historically the use of stone was limited by the feasibility and cost of transport. Early buildings reflected the materials that were available locally. Thus in the East Midlands, where good quality stone is not abundant, most structures were made of mud, or were timber-framed with infill panels of mud and straw; the use of stone was limited to the foundations and to major buildings such as cathedrals, castles and churches. After the late 18th century, the use of locally made bricks became dominant. The advent of canals and railways made a greater variety of materials available, when stone quarrying became an important industry throughout the 19th and early 20th centuries. But from 1920, the increasing labour cost (and extensive use of concrete) resulted in a steady decline in the number of working quarries. The use of stone is now very limited, and most commonly involves the repair, reconstruction or extension of historic buildings. Most new buildings are steel or concrete framed and possess only a thin cladding of natural stone (Fig. 1). Rising costs have resulted in the development and use of artificial stone, of which some types are good replicas (from a distance).

The variety of building stones within Nottingham may best be appreciated in two walks that loop around the city centre. Each walk will take around two hours. The stops shown on the route maps have been selected so that the walks display an optimum variety of the large number of rock types available in the city. Buildings are largely identified by their occupiers, but shops frequently change hands, so reference should be made to their sites, located and numbered on the map (Fig. 2). Change may also involve new facades within new corporate images, so readers should be aware that some stones (notably shop-front cladding materials) may have been changed since this text was prepared.

The stones most widely and repeatedly used are generally only described at their first sighting on each walk, unless improved examples are encountered later; notable among these are Portland Stone (limestone), York Stone (a trade name given to many Carboniferous sandstones and flagstones from the Pennines), larvikite and the Scottish granites. The Permian building stones from the Mansfield area vary from sandstones to sandy dolomites and limestones, so descriptions vary between individual sites. Many marbles are geologically limestones, as they are unmetamorphosed, but the term marble is used more widely in the construction trade to include any limestone that will take a polish.



Figure 1. Cladding of sandstone, granite and larvikite, over the brickwork of the old Nottingham and Notts Bank (30), which was exposed during renovations in 2005.

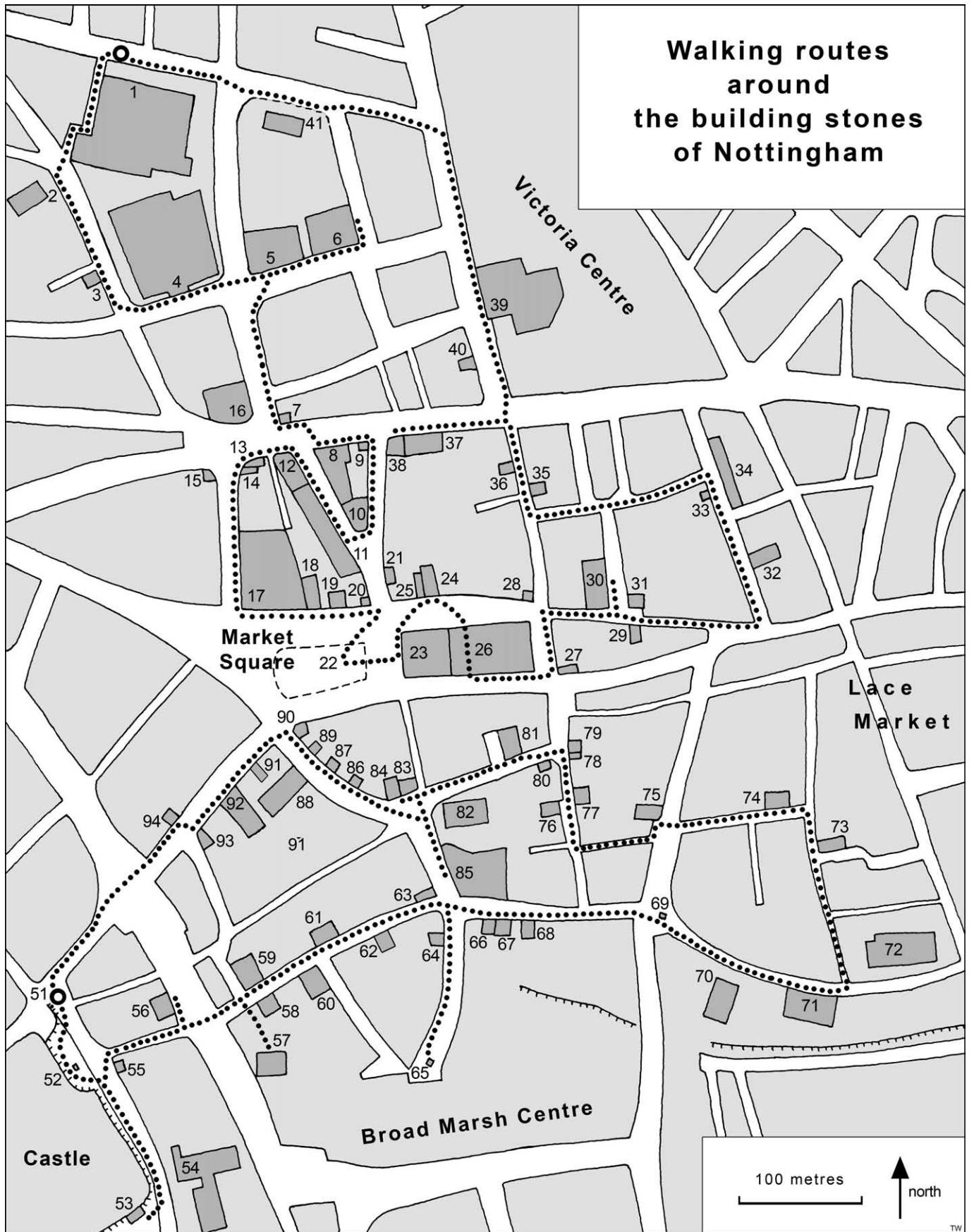


Figure 2. Routes of the walks around central Nottingham.

The northern walk

North of the Market Square

The walk starts at the Nottingham Trent University's **Arkwright Building (1)** in Shakespeare Street, a superb example of the decorative use and versatility of the Middle Jurassic Ancaster Stone from the Lincolnshire Limestone Formation (Fig. 3). This buff-coloured, well-sorted, shell-detrital, cross-bedded, oolitic limestone is laid as sawn (ashlar) blocks. Built in 1877-80 for the University College (before it moved to its Lenton site), the main door frontage is decorated with colonettes, statues, a frieze and decorative leaves. All are relatively unweathered, and illustrate the excellent freestone qualities of Ancaster Stone. The roof is covered with green Westmorland Slate. The boundary wall is a mixture, mostly of medium to fine-grained Carboniferous sandstone, with repairs of coarse quartz-sand artificial render; it also contains pillars, wall stones, and copings of Jurassic oolitic and shell-detrital limestone. Up Bilbie Walk, the eastern wall of the Arkwright Building has deteriorated due to weathering (near the steps of York Stone). After suffering major bomb damage in 1941, some of the original Ancaster Stone, with its characteristic wavy banding due to varying cementation, was replaced by fine grained sandstone; this was laid on edge, and now shows exfoliation (peeling) along the vertical bedding. Artificial sandy render has been used to repair some of the stones beneath the windows, but this has also blistered.

St Andrews Church (2) dates from the 1860s, and has been recently cleaned to reveal a delightful Victorian extravaganza. It is mainly built of variously buff, honey-brown and sometimes red-tinted Bulwell (Golden) Stone from the Permian Cadeby Formation (Lower Magnesian Limestone). This coarsely crystalline dolomitic limestone, dressed in pitch-faced blocks, was the most common building stone in Nottingham, almost always used in the stone boundary wall of properties dating from Victorian times onwards. Originally deposited as a limestone, it was subsequently dolomitized, and only traces of bedding remain; most of the detrital bioclasts and ooliths have been replaced by dolomite crystals, and small voids



Figure 3. The magnificent Arkwright Building (1), with the Newton Building (4) beyond, both faced with limestones.

were left after the recrystallisation. There are up to eight decorative courses of thinly bedded, bluish-grey, silty limestone from the Jurassic basal Lias (formerly Hydraulic Limestone or Blue Lias, now Barnstone Member of the Scunthorpe Mudstone Formation). Ancaster Stone has been used as a low level plinth, an upper course, cappings to buttresses and in the mouldings of doors and windows. Unusually, the main entrance in Goldsmith Street is flanked by contrasting colonettes; to the left is a pink, medium-grained, dolomitic sandstone, possibly from the Permian at Mansfield, and to the right is a white, fine-grained oolite. The boundary wall of Bulwell Stone has a coping of Carboniferous sandstone.

Up Goldsmith Street, the former Indian restaurant **(3)**, between the brick-and-limestone Masonic Lodge and the old brick public house, has its front clad with a terrazzo - an artificial material of angular fragments of natural stone set in a synthetic cement; these fragments are dark grey marble from Italy.

Across the road, the Trent University **Newton Building (4)** is clad in white oolitic Portland Stone (Fig. 3). The larger sawn blocks of this Upper Jurassic limestone contain varying proportions of ooliths and shell-debris, mostly of medium to fine grain with banding, cross-stratification and scour structures that reflect current action at the time of deposition. Some blocks are richly fossiliferous with very large bivalves and rare gastropods, one block shows darker shell-debris-filled burrows. Differential weathering of the coping stones in the boundary wall has resulted in these harder fossil shells standing out from the matrix. By the main entrance in Burton Street, the most uphill block at street level of the protruding podium is a block of oncolitic limestone. Picked out by the weathering, the oncoliths are rounded, concentrically-laminated, algally-accreted grains of micrite (calcite mud), each up to 15 mm across. Some are broken and show signs of reworking. They are associated with stromatolitic masses, another shallow-marine, mud-binding, algal organism, which here show concentric banding with radiating fan-like structures. A layer of granite slabs that underframe the doorway are rapakivi granite from Finland (better seen at locality 25). Along the frontage, resistant Millstone Grit sandstone forms the lowest courses of the building; this prevents the damage, due to rising damp, that is seen in the Portland Stone blocks near the entrance.

The old **Guildhall (5)** bears witness to the freestone quality and durability of the Millstone Grit. The stone was quarried from the Ashover Grit at Sydnop, near Matlock. Built in 1887, almost entirely of sandstone ashlar blocks, and decorated with large columns, friezes and statues, the Guildhall shows little weathering except in the basal course, where rising damp and probably road salt splashing have caused some exfoliation. A hard, bluish-grey, fine-grained, thinly laminated, carbonaceous sandstone, probably from the Coal Measures, has been used in plinths, and in the steps and floor leading to the main entrance.

Next door, the ground floor of the **City Finance Department (6)** is clad with a medium-grey, poorly-cleaved, thinly-bedded slate sawn across its bedding. It shows extremely regular and parallel banding due to ultra-fine grain-size variation within the original, slightly silty, mudrock. This was subjected to low grade metamorphism, with the development of orientated mica crystals. The thin slabs have been sawn almost parallel to this poorly-defined cleavage at 60-70° to the bedding. Round the corner into North Church Street, the slabs are more brownish-grey; some of these show diffuse, brown concretions with compactional distortion of the outer lamination around large nuclei, within which the bedding traces have been destroyed. Black carbonaceous traces can be seen in places. This is probably the Silurian Burlington Slate from quarries near Ulverston, Cumbria. Panels around the main entrance in Burton Street were cut from a medium brown limestone, with pisoliths (concentrically layered grains) up to 6 mm diameter that are set in a darker brown shell debris-pelletal micrite (lime-mud) matrix containing possible burrow structures. Some blocks contain few pisoliths but many fossils. Original bedding is marked by rare clay partings. The whole is traversed by thin, slightly displaced, white calcite veins appear en-echelon in two directions, almost at right angles.

Across Burton Street, the large new Corner House block has columns of cast concrete faced to resemble a sandstone. On Upper Parliament Street, the **Turf Tavern (7)** was faced in 1927 with two types of green glazed ceramic tiles. Across the road, the old **Elite Cinema building (8)** is clad with white, glazed tiles known as Faience. It is decorated with glazed mouldings, shields and statues; these were made from a kaolin-rich clay that was fired twice, the second time with a salt glazing. Tiling became fashionable in late Victorian times because of its resistance to staining by the polluted air of the industrial cities. On the King Street corner, the windows of **Trent Bridge Travel (9)** overlie slabs of pale grey shattered marble with dark grey veins, which is the Devonian Grigio Fioritta Timau Marble from northern Italy.

Down King Street, the one-time **Prudential Assurance building (10)**, inside the corner to Queen Street, is built of red terracotta blocks with a glazed surface. Aggressive cleaning of the Peterhead Granite, on the half-basement and also in the two columns flanking the main doorway, has left most of it with a pale pink hue. The rock contains few mafic minerals, small xenoliths and veins of clear quartz, the crystal boundaries of which are clearly visible. The steps of red granite with large, pink, feldspar phenocrysts, are more typical of this rock. Across Queen Street, the old **Post Office Building (11)** is now a series of shops. It was built of Stancliffe-type Millstone Grit from Darley Dale, Matlock, and its large ashlar blocks consist of well-sorted, sandstone with scattered ferruginous grains. The pediment includes blocks of medium- to coarse-grained grey Rubislaw Granite, from Aberdeen,

some of which has been replaced by a finer-grained grey granite. The original main entrance (now a display window of Milli's) is framed with blocks of the dark red variety of Shap Granite from the Lake District (see back cover). Up Queen Street, the new **Post Office (12)** is faced below its windows with a green, lustrous schist, with elongate flakes of mica that give the rock its shiny appearance. The sills were cut from green Honister Slate from the Lake District.

Back on Parliament Street, the ground floor of **O'Brien's** coffee house (13) has been clad with coarse equigranular Peterhead granite; small xenoliths (partially assimilated fragments of country rock, colloquially known as heathens) are finer-grained and darker due to the high proportion of mafic minerals. The stone is a mismatch with the brick-red, Scandinavian granite that was used when the side door in Market Street was realigned. Next door, a pale cream to brown Cornish granite has been used in **Graham Hill Menswear (14)**, but its paved entrance floor consists of varieties of red, purple and green phyllites, both riven and cut. Across the road, the **Reflex Bar (15)** has a frontage of Portland Stone on a plinth of rough-hewn, grey, Cornish granite. Across to the right, the columns and portico of the **Theatre Royal (16)** are painted, but records suggest that the columns and the capitals are of Ancaster Stone.

Further down Market Street, **Debenhams (17)** is a department store that expanded by incorporating lesser buildings. At its uphill end, yellowish-brown, fine-grained Monte Bracco quartzite tiles from the Italian Alps, north of Turin, floor the doorways. A dark grey gabbro is used beneath the windows, while mylonised grey Kemnay Granite from Aberdeenshire is used in the columns. The latter is medium-grained with a speckled appearance due to its white feldspars (with square cross-sections) and large brown feldspars (both are crushed), mica crystals and vitreous quartz. The rock is weakly foliated. Above the shop windows and the courses of white Portland Stone and then sandstone dressed to a vermiculation finish, the buff, rubble-faced wall is either a Carboniferous or Triassic sandstone (such as Hollington White); it contrasts with the Ancaster Stone of the window structures.

The Old Market Square

The traditional heart of Nottingham is an open-air geological museum, notably along the Long Row frontage with its colonnade of pillars of various rocks. The first ten, in front of **Debenhams (17)**, are square. Numbers 1 to 3 (starting from the Market Street corner) consist of dark grey to brown, coarse-grained, weakly foliated, Kemnay Granite with pale brown feldspars, dusky quartz, strings of mafic material including biotite, muscovite, and rare xenoliths. Pillars 4 to 6 are clad with pale greyish-cream granite containing flow-aligned, off-white feldspar phenocryst laths up to 10 mm long, from the De Lank quarries on Bodmin Moor, Cornwall. Pillars 7 to 10 reveal intensely deformed gneissose granite, probably from

Brazil, with deformed biotite mica schlieren (thin sheets), the whole cut by veins (Fig. 7); the parent granite underwent several stages of metamorphism. Panels below the shop windows appear to be a dark brown larvikite from Argentina. Intervening columns are clad in pale grey shelly limestone (biomicrite) consisting of coral (including *Thamnopora*), algal and bryozoan masses, and brachiopods, with the coarse shell debris set in a micrite matrix. The rock shows stylolites and micro-faults and is of Devonian age, possibly from Belgium.

In front of **Pizza Hut (18)**, round pillars 11 to 14 are made of grey, medium-grained Rubislaw Granite (Fig. 9); this has pale buff, zoned feldspar phenocrysts up to 10 mm long, with biotite and muscovite micas and rare xenoliths. Round pillars 15 to 17, in front of Vegas and the Lounge, are paler in colour with more quartz, but are weakly foliated and typical of the Kenmare granite from Ireland. The upper floors of the building are faced with white and pale green Doulton Carraraware ceramic tiles.

In front of **Schüh (19)**, and Clinton Cards pillars 18 to 22 consist of polished larvikite. This is a coarse-grained igneous rock related to syenite that comes from the Larvik area of Norway. About a third of the rock is augite, but most of it is made up of large feldspar crystals. These have a perthitic structure, as sodic feldspar exsolved from the plagioclase feldspar during crystallisation to create a micro-lamination within the crystal. Light reflected from these numerous internal surfaces produces the bluish iridescence known as schiller. Since the large feldspar crystals have diverse orientations, there is a play of colour as the surface is viewed from various angles. The effect is emphasised where the stone is cut and polished nearly parallel to the planar mineral fabric. Larvikite has been used extensively for external cladding of licensed premises, to the extent that it has become known as “publichouseite”, though its main use in England now is as armour stone to limit coastal erosion. Pillars 18 to 20 are the coarse, dark, Emerald Pearl larvikite, while pillars 21 and 22 are a finer-grained type, and the paler Blue Pearl larvikite forms panels beneath the windows of **Arden News (20)**.

The wall panels behind pillars 18 and 20 consist of dark green and black brecciated and veined serpentinite. An unusual metamorphosed siltstone is used beneath the windows and as one course of paving at the Schüh shop (21); it has an uneven, weakly crenulated riven texture with a slight schistosity. The last three pillars, 23 to 25, as far as the corner at Arden News (20), each have 4 ribs and are compound in the lower part with grey Rubislaw Granite overlain by red Peterhead Granite. Behind pillars 23 and 24, columns around the windows of the Garage are a pale yellow marble with black minerals tracing lenticular metamorphic structures. The building above displays spectacular brick architecture by Watson Fothergill. Across King Street, superbly carved freestone of Millstone Grit sandstone (Fig. 4) is used in the window and door mouldings of the **Acton's offices (21)**.

Within the **Market Square (22)**, kerbstones along the pavement edging Long Row are of red granodiorite, probably from the Mountsorrel quarry in Leicestershire. In contrast, the other side of the road has kerbstones around the central paved area of pale grey granite, and the steps in the central open Square are the same material. Its large white feldspar crystals distinguish its source, but this could be any of various quarries within the complex porphyritic zones of the batholith that underlies Southwest England.

Dominating the square, the **Council House (23)** has a steel frame clad with thick slabs of Portland Stone. This well-known, white, Jurassic limestone from Dorset has varying proportions of ooliths, shell debris and intact shells, set in a crystalline cement of calcite spar, and some blocks show distinct banding of grains by size and composition. Its excellence as a freestone is illustrated by its wide use as the sawn ashlar blocks, and also in the fine carvings on the front of the building (Fig. 6). The coarse, porphyritic Cornish granite forms a plinth to the lion statues and also the front steps. The floor of the entrance patio has large square flags of York Stone quarried from the Lower Coal Measures Elland Flags near Halifax. These are enclosed by a grid of rectangular slabs of dark grey, micritic Carboniferous Limestone, which contain scattered crinoid ossicles, tabulate michelinid and rugose corals and cross-sectioned brachiopods.

Visitors may normally go into the entrance vestibule (but no further) and this is lined with a splendour of limestones and marbles. The walls consist of large panels of pale buff limestone with stromatoporoid masses and some rugose corals, the Cretaceous Perlato marble from Italy. The floor consists of pale cream, shelly, micritic limestones. Blocks of pale grey limestone with large cone-like rudist bivalves, probably from Iberia, are laid to form a circle, in the centre of which the City's heraldic arms has been created by inlay. This uses coloured marbles and limestones, pale and very dark green serpentinite, and small areas of brightly coloured stones, including lazurite. The back of the stag and antlers consist of an Upper Devonian Griotte marble from Belgium, while the yellow marble is probably from Siena in Italy.

In Long Row East, the **HSBC Bank (24)** has rough-dressed columns of pale grey, medium-grained, foliated Kemnay Granite that provide a visual contrast



Figure 4. Delicate carving of sandstone on Acton's (21).

with the same rock forming the polished columns in front of the adjacent **Going Places (25)**. The same granite, with xenoliths, is used as facing to the Bank. Columns between the windows of Going Places are reddish brown rapakivi granite from Southern Finland. Known as Baltic Brown, the rock is characterised by its golf-ball-size phenocrysts of orthoclase feldspar that contain small biotite crystals in roughly concentric bands. Many of the large phenocrysts also have a late-stage reaction rim of colourless or greenish-grey oligoclase feldspar, to produce the rapakivi texture (Fig. 15). The matrix has smoky quartz, mafic minerals and minor feldspar.

Exchange Arcade (26), beneath the rear of the Council House, is clad with buff-coloured Bath Stone, a well-sorted Middle Jurassic oolite. In the floor beneath the dome, an inlaid compass is made of white Carrara marble from Italy and black Carboniferous limestone from the Pennines set into York Stone flags (Fig. 5). Through to Cheapside and left to High Street, **Barclays Bank (27)** has panels and its lower cladding of grey granite, probably from Sardinia, with its complexly intergrown and altered, pale fawn and white feldspars. On the corner of Clumber Street, **The Link (28)** has columns faced with slabs of green, fine-grained volcanic sediment. Metamorphosed to a low grade slate, this rock shows original grain-size banding, graded bedding and clay partings, but the bedding is now deformed. It originated as a water-lain tuff, and is quarried from the Ordovician Borrowdale Volcanic Group of the Lake District.

East of the Market Square

Up Pelham Street, **Tanners (29)** was built in 1860 as the Nottingham Journal Building. Its upper story facing is mainly brick with pale brown Millstone Grit sandstone quoins and window moulding. The same stone is used for a vine-leaf decorated frieze, with demons beneath the windows. Heads carved from sandstone stand at the base of the window arches. The first floor windows have narrow colonettes of pale pink granite. The ground floor fascia has been rebuilt and is now clad with a basal course of dark grey gabbro. This is succeeded by a narrow course of rapakivi granite (beneath window level), which is repeated higher up. The main panels are a pale greenish grey to fawn, folded and foliated migmatite with distinct crystal banding and swirl-like folded



Figure 5. The inlaid compass in Exchange Arcade (26).

masses (Fig. 10). The source of this beautiful stone is unknown. Beneath it, the floor at the entrance consists of a terrazzo coarser than that seen at locality 3; it has inlays of various stones, including brown Sienna marble, pale-pink Italian Rosso Classico marble, grey Tranovaltos marble from Greece, green serpentinites, and the brick-red Ammonitico Rosso limestone that retains its pseudonodular sedimentary texture (Fig. 8).

In Thurland Street, the splendid building that originated as the Nottingham and Notts Bank is now occupied by **Prada** and another clothes shop (**30**). Built in 1877-82, this is often claimed as Nottingham's finest work by Watson Fothergill. The main structure is built of Darley Dale sandstone from the Millstone Grit, with the latest renovations using matching stone from Grindleford. An excellent freestone, this has been extensively carved to produce gargoyles, statues, and shields depicting the coats of arms of several Nottinghamshire towns; diagonal scoring was chiselled into the sawn faces, but some weathered blocks show cross-bedding. Red Permian Mansfield dolomitic sandstone was used for the colonettes, but some have been replaced with darker red sandstone, possibly the Triassic St Bees Red sandstone, which shows distinct bedding traces in several places. The pediment comprises grey Blue Pearl larvikite along the Pelham Street frontage and round the corner (Fig. 1). Further, along Thurland Street this is replaced by a medium-grey, medium-grained granite with distinct crystal banding, superb mafic xenoliths, quartz-rich pockets and thin veins; its gneissose texture suggests that it may come from Norway. To the right of the main door, a darker grey, finer-grained granite, perhaps from Rubislaw, has been used to complete the pediment across an original doorway. The succeeding course is Balmoral Red Granite that came from Finland with a trade name chosen purely for marketing; it contains both dark, mafic-rich and pale, feldspar-rich xenoliths. Some of the frontage has been replaced by blocks of a slightly darker and finer granite. A grey granite is also used in the colonettes beside the main entrance. Above the door, a carved medallion of medium-grained Mansfield Red sandstone is set in a block of buff, coarse-grained, micaceous sandstone carved to depict both Nottingham Castle and the Major Oak of Sherwood Forest. High above street level there are three exquisitely carved white Portland Stone friezes. The roof is covered with green slates probably from Cumbria. Visible from the east side of the street, a stone monkey stands against the brick chimney at the northern end of the building; a 'monkey' is a slang term for a mortgage and reflects the fact that at one stage the Bank owed money to the architect, who thus held a mortgage on the building.

Opposite is the **Thurland Hall** public house (**31**) which was built in 1906 using a Carboniferous sandstone, with decorative brick-red granite with red feldspar phenocrysts and also a white Carrara marble door step. A short way down George Street, an originally prestigious house (**32**) on the right is clad



Figure 6. Portland Stone on the Council House (23).



Figure 7. Gneiss cladding in front of Debenham's (17).



Figure 8. Terrazzo floor in Tanners' entrance (29).



Figure 9. Gneiss and granite on Market Square (17-18).



Figure 10. Migmatite cladding on Tanners (29).

with yellow brown ashlar blocks of Mansfield White Sandstone. Past the junction with Old Lenton Street, the former Watson Fothergill Architect's offices (33), were brick-built with typical decorative Millstone Grit sandstone dressings and carvings (Fig. 11). The building opposite, renovated as apartments (34), has basal courses of the fossiliferous and bioturbated, sandy, ferruginous limestone, that is Hornton Stone from the Lower Jurassic Marlstone near Banbury.

Through into Clumber Street, and within the new building, **Silver Screen** (35) has its central pillar and ground-level panels clad with a pale grey diorite; opposite and further up, **River Island** (36) has an unusual green gneiss forming the base of its columns; both stones are from unknown sources.

Round the corner in Upper Parliament Street, the **Express Chambers** (37) is another fine example of work by Watson Fothergill. The basal course near the Express Offices doorway is a grey sandstone, some blocks of which were face-bedded (laid with their bedding vertical) and now show severe exfoliation. The bulk of the building is built of the Carboniferous Ashover Grit from the Stancliffe quarries at Darley Dale; it is a coarse-grained, honey-brown and buff sandstone showing traces of cross bedding. The red Mansfield Stone is used for alternate blocks in the window arches and in the ground-floor window colonettes and pillars. At the adjacent Express Buildings, now **Frankie & Benny's** (38), the same Watson Fothergill style has pink Peterhead and red granites in the door surrounds and under the windows.

On Milton Street, the main entrance to **John Lewis** (39) is clad with a pale, fawn, laminated, freshwater, micritic limestone, probably the Botticino Marble from Italy, with traces of ultra-fine shell debris and rare peloidal bands; it has distinct stylolites with some shallow channel structures. Across the road, **Pierre Victoire** (40) is faced with sandstone, red granites and two varieties of larvikite. The **Fire Station** (41) is built of a Millstone Grit sandstone, with doorways framed in grey, weakly-foliated, mica-rich granite. Continue past the significantly more attractive Arkwright Building, to the end of the northern walk.



Figure 11. Architectural detail by Watson Fothergill (33).

The southern walk

The Castle approaches

A castle has occupied the ridge of Triassic sandstone above the River Trent since the 11th century. After its Civil War demise, it was replaced by a grand mansion; this was then destroyed by fire and rebuilt in 1876-8 using pale-brown Coal Measures sandstone from the Trowell district. The walk starts at the Parish Boundary marker near the Castle Entrance at the top of Castle Hill (51). The wall is made of buff to brown, coarse dolomitic limestone (Bulwell Golden Stone) from the Permian (see locality 2); it is capped with York Stone sandstone from the Coal Measures. Paving setts below the marker are mostly from Charnwood Forest, including the distinctive greenish-pink Mountsorrel granodiorite and the granophyric diorite from the Markfeld quarry; some have zoned feldspar crystals, and there are also several bluish-white syenites and a basalt. The adjacent paving stones are York Stone flags, Carboniferous sandstones riven on their bedding planes. Across the cobbled roadway, paving slabs on the east side of Castle Hill are blocks of similar sandstone from the Namurian Rough Rock quarried at Scoutmoor in Lancashire; these have been sawn across their structure to show the concentric Liesegang rings that were created by oxidation on weathering fronts within its pore-water.

Below the castle approach, the bridge arch has a basal course of medium-grained Millstone Grit sandstone set into the Triassic sandstone bedrock. The arch is faced and lined by blocks of soft, pale grey, fine-grained sandstone with rounded quartz grains, which resembles the Triassic rock from near Castle Donington. Adjacent walls are built of this, mixed and capped with Bulwell Stone and Millstone Grit, and the surmounting tower was built more recently in ashlar sandstone. In the buttressed wall, the higher part shows honeycomb weathering of the sandstones.

The Robin Hood statue (52) rests on a plinth of a buff, pelletal, shell-fragmental limestone that is Clipsham Stone from the Jurassic Lincolnshire Limestone Formation. Its grains, up to 3 mm diameter, are oncoliths (algally accreted lime-mud particles) and pebbles of calcite mud (micrite). The wall behind the statue consists of coarse, rough-dressed sandstone, overlain by smooth sawn sandstone blocks. The panels of pale-buff to cream, coarse-grained, cross-bedded peloidal limestone are from the same Lincolnshire Limestone source.

Down the hill, Castle Road lies beside a cliff of Nottingham Castle Sandstone (Fig. 12), though much is lost behind masonry walling and an area of reinforced plastic coating (recently applied to curtail severe local weathering). The cliff was steepened prior to the building of houses (now removed) whose back rooms extended into the artificial caves that still remain behind the doors. The sandstone is weak, red-brown, medium-grained and cross-bedded, and was formed as a sequence of fluvial channel-fill deposits,

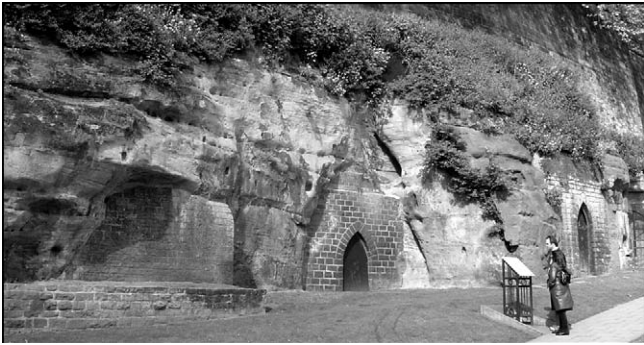


Figure 12. Sandstone caves on Castle Road (53).

with the base of each channel unit marked by a string of resistant pebbles, mainly of quartzite. The rock has been extensively excavated to create the many cave cellars in Nottingham, including the public bars at the rear of the nearby **Trip to Jerusalem (53)**.

Wall panels below the windows of **People's College (54)** are clad in cleaved and broken slices of pale-greenish-grey, fine-grained tuff, with its grain-size and colour banding best seen near the main entrance. This volcanoclastic sediment was deposited in water, and was subsequently metamorphosed into a slate. It probably came from the Lake District quarries in the Ordovician Borrowdale Volcanic Group. Finer, dark grey, Welsh slate forms the window sills.

Up the eastern side of Castle Road lies the historic **Severns Building (55)**. This 14th century house was moved from its original site on Middle Pavement; it uses no stone, but has a timber frame with an infill that was originally lime mortar and is now a granular cement. Through Castle Gate, **Castle Heights (56)** on Maid Marian Way has doorway panels of a brown, medium-grained syenite with fawn, fractured feldspars, and a weak lineation in elongated concentrations of mafic minerals; it is probably Fox Brown from Finland. An area above and right of the doorway has been clad in Portland Roach, an unusual type of Portland Stone; its cavernous texture results from the leaching of aragonite shells during diagenesis. The carved panel is typical, white, oolitic Portland Stone.



Figure 13. Two limestones in St Nicholas's churchyard (57).

The lower town centre

Across Maid Marian Way, **St Nicholas Church (57)**, was brick-built in the 1670s with only the quoins and window mouldings of stone. The original quoins and parapets consist of White Mansfield, a pale-yellow, Permian, dolomitic limestone, with its characteristic green clay seams exposed in some of the lower blocks. A harder sandstone has been used to replace some of the limestone. Relative resistance to weathering is seen in some of the tombstones in the small church yard. There is a progressive reduction in durability from the hard Welsh slate (James Wardle, 1913, in the paving) and Swithland Slate (Abel Collins, 1705, against the wall) to the softer York Stone flags (Elizabeth Norton, 1791, in the paving) and Permian dolomite limestone (John Youle, 1811, against the wall), reflecting the changes in mineralogy and increases in porosity of the stones. Beside the path, a monument nearly 200 years old, to Mary Ann James and others, is also built of dolomitic limestone (Fig. 13). This has panels of a more durable, grey, fossiliferous, medium-grained limestone, extensively bioturbated and containing large bivalve and gastropod shells with serpulid tube clusters and rare corals; it is probably from the basal Jurassic Barnstone Member (formally the Blue Lias).

Castle Gate has a number of fine old town houses. Some have Carboniferous sandstone in the lower walls, window surrounds and porticos, while the **Trent FM building (58)** is of the Mansfield White dolomitic limestone. The ground floor of **Browne Jacobson (59)** has recently been re-faced with large blocks of pale, feldspathic sandstone, probably Darley Dale Sandstone from the Millstone Grit near Matlock. At the corner of Stanford Street, an office building (**60**) has a mixture of Carboniferous sandstone and Mansfield Red dolomitic sandstone used as a decorative course over the doors and windows; one sandstone block within the lower wall shows splendid Leisegang rings. Almost opposite, **Rodney House (61)** is clad with cleaved, green Westmoreland Slate, with black Welsh slate forming its window frames. The sandstone facing **Burdon's** solicitors' offices (**62**) contains small black flecks of plant detritus.

Before the corner with Lister Gate, a single broad column between the covered windows of **Wallis's (63)** is clad with a complexly foliated gneiss, probably derived from ultrabasic peridotite. This green rock is banded by variations in mineral composition. Many crystals are elongate and flecked with black specks of a mafic mineral, and mafic porphyroblasts developed during metamorphism along some layers.

Down Lister Gate, **Ravel (64)** has flanking pillars clad in Cornish De Lank granite. The unusual cladding beneath the windows and on a central pillar is a relatively hard, fawn, fine-grained, shell-detrital, oolitic limestone containing coarse bands of shell-debris, bioturbated in parts and with erosion surfaces; this may be Jura Kalk from the Middle Jurassic of Bavaria. In front of the Broad Marsh Centre, the statue plinth (**65**) is the dark, reddish-brown variety of Shap



Figure 14. Sandstone frontage on Galleries of Justice (71).



Figure 15. Rapakivi granite cladding Langford House (94).

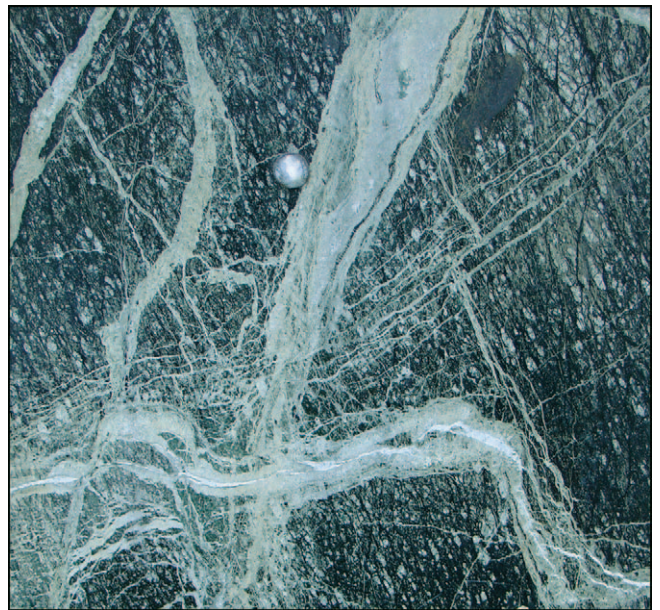


Figure 16. Serpentinite facing on the Orange Shop (86).



Figure 17. Travertine cladding on MacDonalds (83).



Figure 18. Phyllite cladding on Walkabout (92).

Granite, from the Lake District; it has large, pale-pink, euhedral, feldspar phenocrysts in a matrix of red feldspar, colourless quartz and black biotite mica.

Back on Low Pavement, the **Household Bank (66)** dates from 1920 when it was built as a house with Millstone Grit sandstone in ashlar blocks. The rock is a fawn, coarse, well-sorted, feldspathic sandstone with excellent cross-bedding. The adjacent, ornately decorated, Victorian Gothic town house built in 1876 (67) has Carboniferous sandstone courses, capitals, column bases, and oriole window surrounds. Its front columns are of dark grey syenite with white feldspars in a matrix rich in mafic minerals, possibly the Bessbrook Granite from Newry, Northern Ireland; the columns by its door are cream-and-red-mottled, fine-grained, crinoidal limestone with many brick red veins, probably Devonian, and possibly the Ipplepen Stone from the Torquay area. Two buildings up the hill, **Enfield Chambers (68)** was built in 1910 of a dark-yellowish-brown, coarsely-bioclastic, oolitic, cross-bedded limestone. Damaged blocks show that the colour is a superficial effect of weathering, as the interior is buff in colour. The rock is almost certainly Middle Jurassic, probably Lincolnshire Limestone.

The Lace Market

At **Weekday Cross (69)**, the 1993 structure has a plinth composed of ripple-marked Carboniferous sandstone and a column of coarse artificial 'sandstone'. Some of the surrounding area is paved with artificial stone, but there are also iron-stained York Stone paving flags, and these continue along High Pavement (Fig. 19). The nearby **Pitcher and Piano (70)** was formerly the Unitarian Chapel, erected in 1876 for the Anglo-Danish lace workers. It is built of cross-stratified Carboniferous sandstone with a pediment and string courses of buff, bioclastic limestone, a less iron-rich variety of the Lincolnshire limestone. Dating from 1770 as the County Hall, the



Figure 19. Flagstone paving on High Pavement (69).

Galleries of Justice (71) are built of a pale-green-grey, cross-bedded Triassic sandstone; this is distinguished by rare mud flakes (small flat pebbles of mudstone), and, in some blocks, small patches that are secondarily cemented. The frontage is high-lighted by four columns of fine-grained, pinkish-red, Permian, Mansfield Red sandstone (Fig. 14). Its left wing, once the County Gaol, is a Carboniferous sandstone that is slightly more pinkish in colour.

St Mary's Church (72) is built of a diverse mixture of red, buff and pale-brown sandstones from the Millstone Grit. These are cross-bedded and contain scattered small pebbles of ironstone and rare, iron-rich, weakly-cemented concretions. Repaired sections are Bracken Hill Stone, a cream, fine-grained sandstone from the Carboniferous of the Pontefract area. Stone used in the North Chancel has a pimpled surface due to differential cementation and weathering. There is some fine decorative carving.

St Mary's Gate lies across the end of Broadway, one of the finest streets in the Lace Market, with its old lace factories and warehouses built of brick with sandstone detailing. On the corner, **NCN (73)** has below its corner windows pinkish and buff varieties of very-coarse-grained Millstone Grit. Round into Pilcher Gate, the offices of **Euro RSGG Riley (74)** are built of brick and Carboniferous sandstone; they are decorated with colonnettes of Scottish granite that are from Rubislaw beside the windows, and from Peterhead beside the door.

South of the Market Square

Across Fletcher Gate, **Cabaret (75)** is faced with tiles and mouldings of fired clay, and Byard Lane leads through to Bridlesmith Gate. **Flannels (76)** has a base-course facing and door plinth of rapakivi granite with its spheroidal feldspars; the doorway to the offices above has a surround of Portland Stone. Nearly opposite, **Jigsaw and Muji** share a building (77) with columns faced in dark diorite. The doorway to **Gala Casino (78)** has columns of pink Peterhead Granite on plinths of grey Cornish granite, with a pale, partially-resorbed xenolith exposed in the right front panel. Next door, **Berry's (79)** has columns faced in a pale marble with patchy texture.

In St. Peter's Gate, **Rutland Chambers (80)** has a doorway built of sawn blocks of brown sandstone with excellent current-bedding with colonnettes of Mansfield Red sandstone. Across the road, the basal courses of the old court building (81) are pale, red-tinted, buff, very coarse Millstone Grit sandstone, with its vermiculation dressing being destroyed by weathering. Above window-sill level, Ancaster Stone, a buff, fine-grained, oolitic limestone shows few bedding traces, but its wavy-banded differential cementation can be seen on the corner into Bank Place.

The upper end of the retaining wall to **St Peter's Church (82)** consists partly of coarse Millstone Grit sandstone. Downhill from the main entrance steps (of York Stone), the wall is of banded, shell-detrital,

oolitic limestone from the Lincolnshire Limestone (either Clipsham or Ancaster Stone), above a basal stone course of, pale grey granite with milky white feldspar laths and colourless quartz. The oldest part of the church and the tower consist of large blocks of fawn Triassic sandstone. A similar sandstone, much less weathered, was used in the newer north aisle, but a variety of building stones has been used in the south aisle; a fine-grained Carboniferous sandstone is the most common component. There is a plinth and one course of very coarse shell-detrital, pelletal, oolitic limestone with bored intraclasts (pebbles of micritic limestone) and coral debris, and the buttresses are built of oolitic limestone; both these stones are probably from the Ancaster quarries in Lincolnshire.

Across the road, **MacDonalds (83)** uses the St. John's Travertine, from Tivoli, near Rome as cladding on its inner city branches (Fig. 17). The rock is banded calcite deposited by hot springs in an unstable environment where the centre of deposition was continually migrating, with consequent collapse and reworking of earlier sediment. This turbulent history is revealed in the ultra-fine lamination and banding, that is mostly planar but locally undulose, clearly seen in the polished slabs. Ill-defined pockets and bands of contemporaneous angular breccia fragments and of coated grains ranging from ooliths to pisoliths and larger oncoliths, are witness to current activity during deposition. The bedding is cut by vertical tubes which were infilled after the decay of the stems or roots of plants. Next door, **The Halifax (84)** is a fine example of ashlar construction using coarse-grained, shell-detrital, oolitic limestone, probably Clipsham Stone.

Down Albert Street, the fountain was carved from white marble, probably from the famous quarries at Carrara, in the Apuan Alps of northern Italy. Further down, **Marks and Spencers (85)** has a dark, greenish stone as cladding on the columns and lintels along the ground floor. This is Madre Perla, a cordierite gneiss quarried from lenses in the metamorphic belt of the Andes, north of Cordoba in Argentina. The panels are cut across the large, aligned cordierite crystals, which produce a pearly lustre akin to schiller in larvikite but in a totally different mineral. Panels beneath the windows are a dark grey gabbro, probably Bon Accord from the South Africa Bushveldt intrusion.

North up Wheeler Gate, the **Orange Shop (86)** frontage has been decorated with panels of coarse brick red granite with feldspar phenocrysts and colourless quartz, probably Balmoral Red from Finland. The main columns are clad with black and green serpentinite (Fig. 16). Originally a peridotite, this was sheared and metasomatised, possibly in several phases, to create a brecciated fabric with multiple shear zones; this deformation may have occurred during or after the serpentinization of the parent rock. **Nationwide (87)** has panels of dark grey

Rustenberg Gabbro from South Africa beneath the windows. Panels of white crystalline metaquartzite adjacent to the door have irregular, ill-defined, grey, mafic-rich patches. **Virgin Megastore (88)** has columns clad in pink and white granite, standing on plinths of darker grey diorite, with panels of South African gabbro at pavement level.

Near the top of Wheeler Gate, **Herberts (89)** has columns of a grey, brown-stained, coarse-grained porphyritic granite, with white ill-defined fractured feldspars set in a feldspar-rich matrix including mafic minerals and small xenoliths. This Spanish granite has traces of foliation in the alignment of its two micas. The adjacent column by the doorway to the upstairs Federation Chambers has a contrasting cladding of Peterhead Granite, which is more acidic, with pink feldspars, colourless quartz, few mafic minerals and rare xenoliths. On the corner into the Market Square, the **Bradford and Bingley (90)** has two multi-faceted columns clad in dark medium-grained gabbro.

Across into Friar Lane, the isolated doorway into the offices of **BPP (91)** has its left side faced in an almost totally brecciated variety of serpentinite. This is darker and less altered than that used on the columns of Orange (86). Both varieties of serpentinite probably came from Italy.

Further up Friar Lane, **Walkabout (92)** now has a synthetic cladding except around the surviving old doorway at its far right end. This is framed with an unusual, greyish-green and brown, medium-grained, metamorphic rock with crenulated microfolds (Fig. 18). Stretching and breaking of the layers has resulted in concentrations of micas and quartz-feldspar groundmass. Originally a thinly-bedded, silty mudstone, the rock has been metamorphosed to phyllite; some panels show shearing and brecciation. **Harper Recruitment (93)**, at the corner of Spaniel Row, is clad with dark grey gabbro. The main surface of each panel has been dressed to a rough, fractured surface, but this is enclosed in a smooth, cut and polished, marginal zone, which appears much darker.

Across the road, **Langford House (94)** displays the red, orbicular, rapakivi granite from Finland (see locality 25, and Fig. 15). The start of the southern walk is regained by continuing up Friar Lane to the Castle, and the beautiful rapakivi granite is a fitting stone to end the walking tours.

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