
This excursion guide is a draft chapter, subject to revision, to be published in a field guide book whose reference is: Lavis, S. (Ed.) 2021. *Geology of the Bristol District*, Geologists' Association Guide No. 75.

It is not to be circulated or duplicated beyond the instructor and their class. Please send any corrections to Michael Benton at mike.benton@bristol.ac.uk

Bristol Building Stones Tour 2 Clifton

Michael J. Benton, Mary Benton

Objectives

The aim of this walking tour is to learn something about the history of building stones in the Clifton area of Bristol. We will look at a range of buildings and monuments, most of them dating from different times in the building up of the city; some are built of locally sourced rocks, and others feature some exotic rocks from further afield. The vernacular stones used since Roman times in the Clifton area include examples from the Carboniferous, Triassic and Jurassic, and these are introduced in more detail in another chapter (Chapter XXX; Fig. 1). We also inspect some old quarries in the Carboniferous of Clifton that show sources of some of the building stones we see in use. There is a connected walking tour that explores the buildings and quarries of the City centre and parts of east Bristol.

Risk analysis

As these are urban areas, we make no special safety recommendations beyond the extremely obvious proviso: hammers are not to be used on any of the public buildings, monuments or quarries that we encounter during the trip.

Maps

OS Landranger Sheet 172 1:50 000 (Bristol & Bath)
Explorer Sheet 155 1:25 000 (Bristol & Bath)
BGS Sheet 264 1:50 000 (Bristol)

Main references

Savage (1988, 1999); Stonebridge (1999)

Locations

This trip covers Clifton, and you will walk some 3 km, starting at the Triangle and Bristol City Museum, meandering over Brandon Hill, up past two classic early Clifton Houses, Clifton Hill House and Goldney House, then through Clifton Village to the Clifton Suspension Bridge. The second half of the walk heads past Clifton High School along College Road to Clifton College, Bristol Zoo, All Saints Church on the Pembroke Road, and then the old quarries on Worrall Road and Quarry Steps, a short stroll round the Downs, and then back down Whiteladies Road to finish at Clifton Down Station. All parts of the itinerary can be reached by public transport—the rail station at Clifton Down is centrally located for the walk, and at least two bus routes (numbers 8, 505) meander through

Clifton and Clifton Village. The map of the route to follow (Fig. 1) shows the geology underlying Clifton, though it is actually not visible in many places.

1. Brown's

Make your way to the area on the edge of Clifton called The Triangle, by the City Museum and Wills Memorial Building of the University of Bristol. We first of all inspect these buildings, and then walk through to see an old quarry on Brandon Hill.

The building that is now Brown's Restaurant was opened in 1872 as the original City Museum and Library. It was designed by Foster and Ponton and built from 1867–1871 in Venetian Gothic style, using Bath stone for the window frames, parapet and all detailing, and red and yellow bricks infilling (Fig. 2A, B). The building was heavily bombed in 1940, and the City Council passed the partially wrecked building to the University of Bristol, who restored in it the 1950s, but much decorative detail had been lost. It became part of the Brown's chain in 1992.

2. City Museum

This is the building next door to Brown's. In the 1870s, when the Venetian-style Brown's building was constructed, this was the site of an army drill hall and range, which later became the Salisbury Club. The site was purchased in 1899 by Sir William Henry Wills and a new City Art Gallery constructed from 1901–1905, according to a design by Frederick Wills. The building was eventually extended back up the hill in 1930, replacing the old army drill hall. The building is made from Bath Stone and there are Pennant Sandstone flagstones. Under the archway, the floor is decorated with flint pebbles that presumably came from area of Chalk further afield.

The Museum has a geology exhibit showing local geological history, minerals and gems, and the local Bristol dinosaur, *Thecodontosaurus*. In store are important collections dating back to the 1830s from the collections of the Bristol Institution for the Advancement of Science, Literature and the Arts, which was founded in 1823, occupied first a building at the foot of Park Street (now the Freemason's Hall), then the Brown's Building, and finally passed into the care of the City Council in 1894. The older collections include fossils from the local Devonian, Carboniferous, Triassic and Jurassic, including many type specimens of fishes from the Rhaetian bone beds and *Thecodontosaurus* itself.

3. Wills' Memorial Building Tower

Next door to the museum is the Wills' Memorial Building (Fig. 2C–E), part of the University of Bristol. This was constructed from 1915 to 1925 in an Edwardian Gothic style, to the designs of the eminent local architect George Oatley (1863–1950). The building is listed Grade 1 and drew uncharacteristic praise from the notoriously curmudgeonly Nicolaus Pevsner (1973) in his guide, “a tour de force in Gothic Revival, so convinced, so vast, and so competent that one cannot help feeling respect for it.” The Wills Tower stands 65.5 m high and can be visited, allowing some of the best views around Bristol (Fig. 2D).

There was a University College in Bristol from 1872 but it only became a university in 1909 after Henry Overton Wills donated £100,000 for the construction of this central building. The site beside the City Museum had been occupied by a hospital, which was demolished. In the end, Wills had to make further donations up to a total of £160,000 to complete the building.

Most of the building is made from Bath Stone, an oolitic limestone. The whole tower and front of the building were cleaned by water spray around 2010, and this and acid rain have revealed some of the bedding and fossils within the Bath Stone, on close inspection.

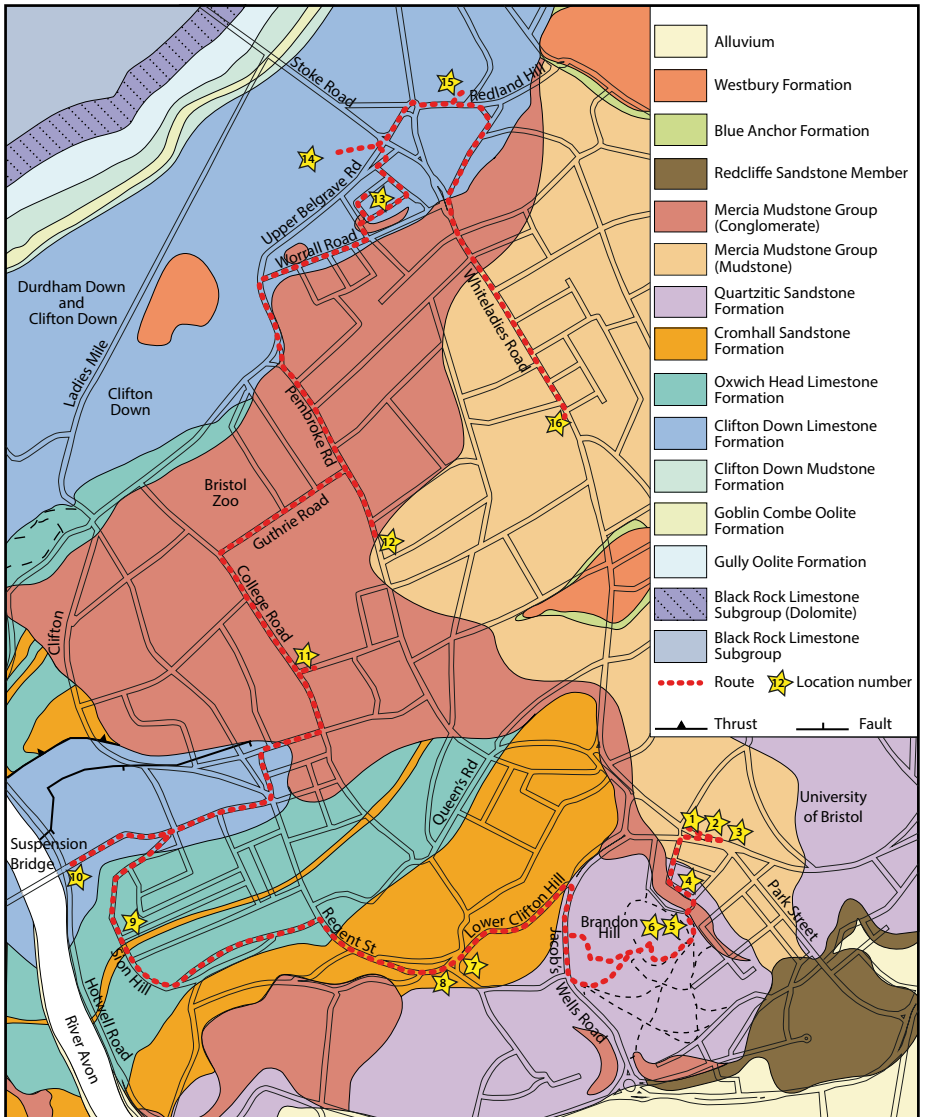


Figure 1. Walking tour map of the Clifton area, showing the key stops, numbered, and underlying geology. (Drawing by Susan Marriott.)

Other limestones were used for additional detail. For example, the statues and carvings on the tower are in Clipsham Stone from Rutland (Fig. 2E). Look for the gargoyles of bearded professors and University dignitaries located high on the building! Clipsham Stone is also an oolitic limestone, but it is harder and more resistant to weathering than Bath Stone. The paving inside the grand entrance hall is a Carboniferous sandstone from near Halifax in Yorkshire (Fig. 2C).

Go through the great doors and walk forward between the huge staircases, and read the display information on how the building was constructed (great structures of wooden scaffolding had to be erected inside the atrium so workmen could do their work) and the choice of building stones for different functions. Oatley was determined to do the work well, and it is perhaps the last great stone building in the UK constructed by Medieval means, in other words by hand cutting of stones and wooden scaffolding.

Cross the road by the traffic lights outside Brown's and enter Berkeley Square through the northern entrance.

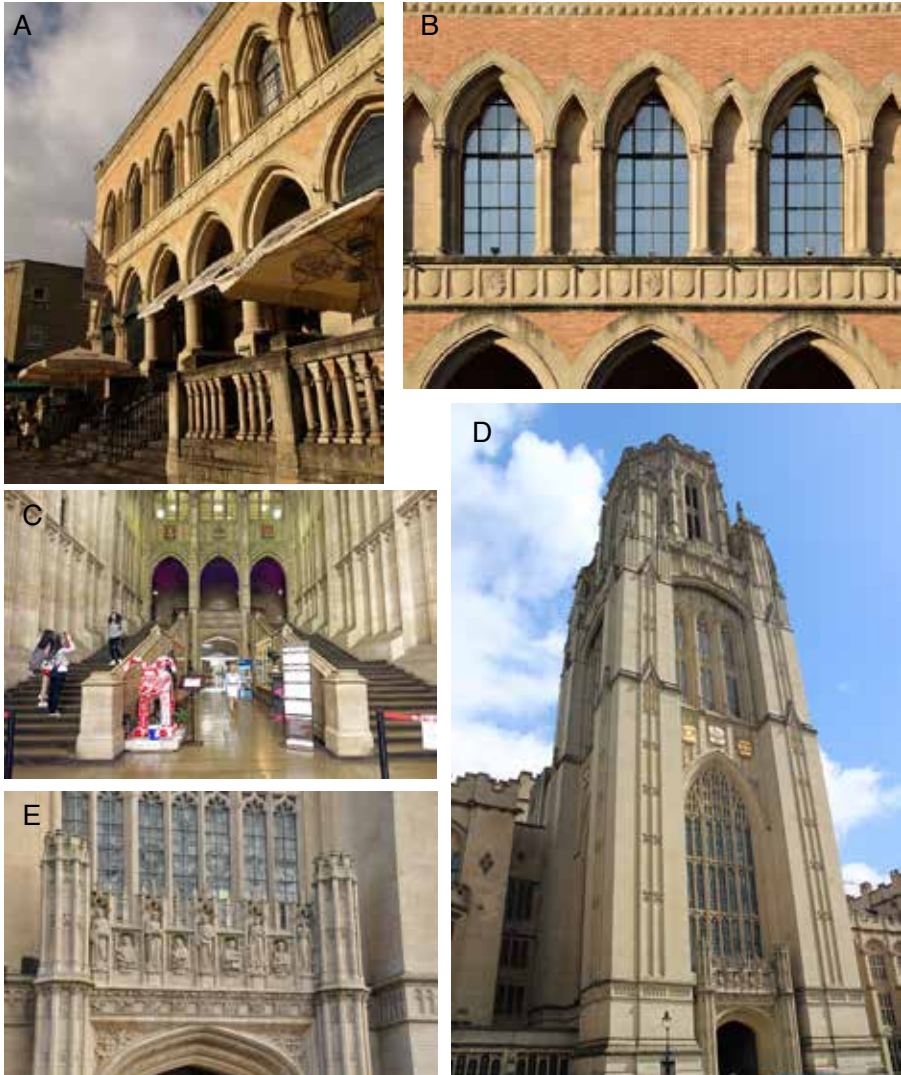


Figure 2. Brown's building (A, B) and the Wills Memorial Building (C–E), showing overviews of the buildings (A, B) and details (B, C, E). (Photographs by Derek Harper (A), Stevekeiretsu (B), Tiia Monto (C), Suicasmo (D), and Nilfanion (E), all Wikimedia, CC BY-SA 4.0.)

4. Berkeley Square

Follow the pavement round the square in an anticlockwise direction, towards the south-west corner. The square was laid out in 1790 by Thomas Paty (1713–1789) and William Paty (1758–1800) and planned as terraces of grand houses around a central garden surrounded by railings. In the gardens is a replica of the Bristol High Cross made by John Norton in 1851 to replace the original dating from 1373 that is now in Stourhead Gardens, Wiltshire. Most of the buildings in this square are made from Bath Stone.

John Macadam (1756–1836), the inventor of the hard core surface for roads lived at numbers 23 and 29. The road surface in Berkeley Square is now covered with tarmacadam but it would originally have been compacted earth with stone setts, that are still present, of Brandon Hill Grit lining gulleys at the side to take away surface water. The pavement and kerbstones are Pennant Sandstone. Originally the roofs would have been Cornish slate transported by ship into the Bristol Docks.

Leave Berkeley Square by the south-west corner on Upper Byron Place, and from there turn left into Brandon Hill park.

5. Brandon Hill

Brandon Hill is a large park with some interesting rock exposures. There are two main lithologies (rock types) exposed in Brandon Hill: 1) Brandon Hill Grit (an Upper Carboniferous quartzite; and 2) Triassic Dolomitic Conglomerate (Mercia Mudstone Group, marginal facies). You may also find Triassic sandstone beds around the small paths winding around the rockery beneath the Cabot Tower. As you enter the park area, a long wall on the left is constructed of rough blocks of Brandon Hill Grit.

Brandon Hill Grit is hard, coarsely bedded quartz-arenite, with irregular jointing and this made it easy to work for building stones. In fact, Brandon Hill Grit was used extensively in constructing Bristol Cathedral, St Johns Gate, and many other Medieval churches and houses, mainly because it occurs under much of central Bristol, and could be broken into squarish blocks using hand tools. By Victorian times, the Brandon Hill Grit was seen more as a rough stone to be used just for garden walls and for house building only if it was to be covered by stucco; by then Bath Stone was favoured. The term ‘Brandon Hill Grit’ is an informal term for subdivisions of the Quartzitic Sandstone Formation, a Late Carboniferous unit known around Bristol and the Mendips. The red colour comes from staining by overlying red Triassic rocks.

Walk along the high wall on your left to the steps down to Charlotte Street. There, on the right, you should see an exposure of Brandon Hill Grit. Continue walking round the hill, while maintaining your height, towards the Tower. On the right are small ponds, produced by a spring that bubbles up here; this was the source of the water that fed St John’s Conduit (see Bristol Centre building stones chapter). The spring is sealed but around it and partly hidden by undergrowth are some blocks of Carboniferous Limestone. The rocks are pitted by weathering and would have originally been part of a limestone pavement or karst environment. Their source is not known but they were brought here for ornamentation during Victorian times. Among the winding paths, you will come across outcrops of almost flat-lying Triassic Sandstone. The beds are also irregularly jointed, and some are held in place by cement.

6. Cabot Tower

The tower was built in 1897 to commemorate the 400th anniversary of John Cabot’s voyage to North America in 1497. The tower is made from Sherwood Sandstone from Nottinghamshire, with details, balconies and a roof of Bath Stone. On the site there had been

a chapel and then a windmill. The tower is 32-m high, and if it is a clear day, it is worth the climb to the top of the tower to see the views of the city and landscape beyond.

At the top of the tower there is a viewing platform with brass plaques indicating points of interest. To the east are the Cotswold Hills forming an escarpment, and at a lower level another escarpment of Jurassic limestone. In front of this, and nearer to the city, is an undulating area in Coal Measures, the Kingswood anticline (an arch-like fold in the rocks). Bristol is situated in a valley in the Mercia Mudstone and Redcliffe Sandstone. To the south, you might be able to see Dundry Hill on the horizon and beyond that the Mendips. The highest hill on the Mendips is Blackdown. This is composed of Devonian-aged sandstones and is surrounded by Carboniferous Limestone.

At the foot of the tower, continue walking westwards, and then straight down the grassy slope towards the old bowling green (now a flat area of mown grass); further exposures of Brandon Hill Grit may be seen here, the site of an old quarry that has been filled and levelled.

Continue to the west and exit the park either onto John Carr's Terrace, or down the steps directly onto Jacob's Wells Road. Walk up Jacob's Wells Road, noting the high walls of Brandon Hill Grit on the right, the wall of Queen Elizabeth's Hospital, a private school. Behind the wall and located high on the flank of Brandon Hill is the school building, the core of which dates from 1874, which is built of Brandon Hill Grit with Bath Stone edgings and battlements. Opposite is Stoneleigh House, formerly known as Hill's Almshouses, built in 1867, also from Brandon Hill Grit with Bath Stone detail.

Turn left up Lower Clifton Hill and follow the road uphill until you reach Clifton Hill House on the left.

7. Clifton Hill House

Clifton Hill House is a Grade 1 Palladian villa (Fig. 3A–C) built from 1746 to 1750 by Isaac Ware (1704–1766), noted architect and translator of Palladio's works into English. One of his stonemasons was Thomas Paty, later to design Berkeley Square (see above). It is worth walking round the house and viewing it from below, as, although the frontage is three stories high (Fig. 3B), the rear, garden side is four stories (Fig. 3C). The house is constructed of Bath Stone, one of the first Bristol residences to use this expensive stone but made available in Bristol by the conversion of the River Avon from Bath to Bristol into a canal in 1727.

The house was occupied John Addington Symonds (1840–1893), a famous Victorian author, and was bought in 1909 to be converted into the first hall of residence for women in south-west England. It was taken over by the University of Bristol in 1911, who combined it with the adjacent Callendar House, and retained it as their hall for female students. Further additions were made over the years, but the exceptional Palladian architecture inside and out was carefully restored by the University's last warden of the house, Annie Burnside who wrote the definitive description (Burnside, 2009).

Continue up Lower Clifton Hill until it joins Constitution Hill, and straight ahead is Goldney House.

8. Goldney House

Goldney House was built in 1724 on the site of an earlier residence for the Goldney family. It is constructed largely of Brandon Hill Grit, with corner stones and window frames of Bath Stone. Note that, in 1724, the house just predates the much more ready availability of Bath Stone for building in Bristol. Later rebuilding of the central portion of the house, seen from the street elevation, but also a substantial part of the rear of the house



Figure 3. Two early Clifton mansions. (A–C) Clifton Hill House, showing the north face (A), a detail of the house name in cross-bedded Bath Stone (B), and the rear elevation (C). (D–E) Goldney House, showing the garden side in Bath Stone (D), and the tower in Brandon Hill Grit, with statue of Hercules (E). (Photos by Charly Stamper (A, B), Francium12 (C–E), the last three Wikimedia, CC BY-SA 4.0.)

facing the gardens (Fig. 3D) was replaced by Bath Stone when the house was remodelled in the 1860s.

It is worth seeing the gardens, but they are rarely open. There is a fine Orangery built from Bath Stone, a canal, a Gothic tower of Brandon Hill Grit (Fig. 3E), and a shell-lined grotto. The tower was built in 1764 and originally housed a Newcomen steam engine, used to pump water, reflecting the financial interests the Goldney family had in the Coalbrookdale Iron Works. The grotto was constructed from 1737 to 1764 by William Goldney III, and is listed Grade 1 because it is the only grotto in the UK with both a shell room and running water.

Continue round Lower Clifton Hill until it turns into Regent Street, running between high Victorian buildings. Turn left and walk along Royal York Crescent, a fine Regency terrace built from 1791–1820, with several bankruptcies and alternative plans during that interval. Go down the steps at the far western end, and walk north-west along Wellington Terrace, which turns into Sion Hill. Pause at the entrance to Caledonia Place on the right.

9. Caledonia Place

Caledonia Place is a long, straight terrace of four-storey Georgian houses, begun in 1788, and completed in 1843. They are largely built from Bath Stone, but the pavement was originally made from slabs of Pennant Sandstone (now replaced by concrete slabs); the Pennant Sandstone horse-mounting blocks remain, however, a common feature of stylish Bristol streets to enable the smart homeowners to climb onto their horses and into their carriages without losing too much dignity. Remarkably, they have not been removed.

The Pennant Sandstone came from various quarries in east Bristol; it is a grey-coloured sandstone rich in lithic grains, feldspar and micas and was deposited in shallow waters in the Late Carboniferous. The poor cementation between individual grains made the sandstone easy to quarry; however, this is counterbalanced by its relative fragility and vulnerability to weathering. The Pennant Sandstone Formation is a 275-m thick unit of green-grey and blue-grey, feldspathic, micaceous, lithic arenites, with thin mudstone/siltstone and seatearth interbeds and mainly thin coals; the lithologies are commonly arranged in fining-upwards channel-fill sequences and laterally equivalent floodplain deposits. The Pennant Sandstone occurs across South Wales as well as around the coal fields south of Bristol. It was especially quarried as a building stone in Victorian times and the early twentieth century from large sandstone quarries in the Avon Valley between Hanham and Newham, and in the Frome Valley above Stapleton.

Continue up Sion Hill and enjoy the view of the Clifton Suspension Bridge. Walk up to the eastern end of the bridge, remaining on the Clifton side.

10. Clifton Suspension Bridge

It is worth inspecting the structure of the Clifton Suspension Bridge, and particularly the rocks from which it is constructed. The bridge famously was designed by Isambard Kingdom Brunel (1806–1859), and construction began in 1831, but was completed only after his death, in 1864. The long delays were caused by bankruptcies at different points. The bridge is listed Grade 1 and is one of the most famous icons of Bristol (McIlwain, 1996; Andrews & Pascoe, 2008; Christopher, 2014).

At the Clifton (east) end, walk first round the south side, and down beside the base [ST 5657 7312]. This is constructed of great blocks of purple-red sandstone (Fig. 4A), some showing clear evidence of cross-bedding, that are examples of classic Old Red Sandstone (Devonian). The blocks were supposed to have been quarried on the Bristol side of the Avon, but Savage (1988, pp. 90–91) thinks it more likely they came from around



Figure 4. The building stones of the Clifton Suspension Bridge. (A) The abutments of the eastern end of the bridge. (B, C) Close-ups of Pennant Sandstone blocks in the tower, showing red mudstone clasts (B) and thin whisps of coal (C). (*Photographs by Michael Benton.*)

Portbury-Portishead. This would make sense and, as particularly large blocks, they might have come up-river by barge, although lifting them up from the river level would have been a huge task.

Above these blocks is a course of Bath stone and then five courses of red Triassic sandstones (Fig. 4A) below the capping of the wall (Savage, 1988, pl. 2). The corner pillars and coping stones of the low wall beside the walkway to the bridge are all made from the same yellow oolitic limestones, probably the Middle Jurassic Bath Stone. It might seem surprising that the stonework of the bridge was not built from the Carboniferous limestones that occur all around, and indeed were blasted in order to build the eastern

pediment. But the local Carboniferous limestones were rarely used for building other than rubble walls (Savage, 1988, p. 91).

Then walk up to the road level and inspect the piers at either end of the bridge. These are constructed of a grey-blue siltstone-sandstone with rare, thin coal layers (Fig. 4B, C); this confirms it is Pennant Sandstone, an Upper Carboniferous building stone commonly used around Bristol (for example in the mounting blocks on Caledonia Place). The use of Pennant Sandstone in the piers, which were erected in 1843, is a very early use of this stone for building (Savage, 1988, p. 94).

We do not explore the geology around the Clifton side of the Clifton Suspension Bridge because that is covered in another itinerary (Avon Gorge Chapter), but instead walk back into Clifton in search of more building stones. Walk along the B3129, the road crossing the bridge, to the 5-way roundabout, and turn left onto Clifton Down Road past Christ Church (built in 1841, steeple 1859, largely Bath Stone). Turn right onto Clifton Park, and then left onto College Road. Walk up to the third right-hand turn, Worcester Road.

11. The two-tone wall at Number 1 Worcester Road

The garden wall of this house, now a part of Clifton College, is famous (Fig. 5A). The house is constructed of yellow-coloured Triassic, possibly obtained locally, with Bath Stone detailing round doors, windows and angles, and some red brick decoration as well. But, as was commonly the case in Victorian times, the garden walls were constructed of rock types regarded as of poor quality by that time (even though they may have been the best building materials for the cathedrals, churches and other Mediaeval buildings in Bristol centre). So, the workmen threw up the high garden wall using Dolomitic Conglomerate (red with brecciated Carboniferous limestone clasts) and Carboniferous limestone (grey), both sourced locally and presumably at low cost. The lower part of the wall is Carboniferous limestone, and the lower detailing and the capstones are an inferior grade of Bath Stone, which has weathered.

Continue along College Road, past the playing fields and grand buildings of Clifton College, and turn right along Guthrie Road. Note the high walls and buildings of both institutions, the Zoo established in 1835, the College in 1862. These are constructed variously of cut blocks of local Triassic sandstone and Bath Stone detailing round windows, doors, and corner blocks.

Continue to the end of Guthrie Road and turn right on Pembroke Road, and walk 200 m south to look at All Saints Church on the left-hand side of Pembroke Road.

12. All Saints Church

All Saints Church was built from 1868 to 1872 by George Edmund Street (1824–1881), a prolific architect of churches. It was bombed in December 1940 (the same night the City Museum was bombed, see above), and only the tower, the St Richard Chapel, and the sacristy remained. After much debate, the church was reinstated in 1967 by construction of an entirely new central portion, designed by Robert Potter (1909–2010) and with fibreglass windows by John Piper (1903–1992).

The original tower is constructed from two varieties of red Triassic sandstones and Bath Stone at the corners (quoins) and round the door (Fig. 5B). Above the main door are alternate stripes of red Triassic sandstones and white Bath Stone. Most of the newer, 1960s building is concrete, but with front walls of Carboniferous limestone, some of it stained pink or reddish, and inside, a font and altar made from Portland Stone.

From the front of All Saints Church, turn right and walk north, up Pembroke Road to the T-junction with Clifton Down (A4176). Turn right and walk around the corner and



Figure 5. Clifton sights. (A) The two-tone wall on College Road, Clifton. (B) All Saints Church, Pembroke Road; (C) Painting of the Chain Quarry, between Upper Belgrave Road, Stoke Road, and Ladies Mile, by William Arnee Frank, painted about 1862. (Photograph (A) by Michael Benton; (B) Rob Brewer, Wikimedia; (C) property of Bristol Museums, Galleries and Archives.)

northwards to Worrall Road. Turn right onto Worrall Road and walk along, looking at the quarries on the left.

13. Quarry Steps and the Bristol dinosaur quarry

In the 1820s and 1830s, there were quarries all along the north side of Worrall Road, mostly operated by Samuel Worrall. There is considerable debate about just where the quarries were, when they operated, and who Samuel Worrall was.

First, on location, it is clear there were quarries all along the north side of Worrall Road, mostly now built over from the 1830s to 1990s. The floors of the quarries were more or less on a level with Worrall Road, and the quarrying continued northwards, nearly undermining the tall houses along Upper Belgrave Road (which were in fact built later). As you walk along, a major turn on the left is into Sutherland Place, which climbs steeply up to Upper Belgrave Road, and then exploring around the small roads called Quarry Steps and Belgrave Hill, shows the height of the back (north) wall of the quarry and some bare rock can be seen. At the west end of Quarry Steps are the steps up to High Street, part of what was once a small quarrying village not connected to the rest of Bristol. Halfway up the steps, you can see one of the classic Triassic-aged fissure fills, marked by red sediment, within the grey-coloured Carboniferous limestone. This spot (map reference, ST 572 747) was selected as the possible original site from which the bones of the Bristol dinosaur were retrieved in the 1830s.

The timing is debatable. We know the quarries were active around 1834, when dinosaur bones were brought by workmen to Samuel Stutchbury (1798–1859), the curator of the Bristol Institution, located then at the bottom of Park Street (see above). Stutchbury and other collectors visited the site and many more isolated bones were acquired and are largely now in the collections of Bristol City Museum (Benton *et al.*, 2000; Benton, 2012). A full study of the quarry locations and dating has not been done, but Benton (2012) noted that many or all might have been active only through the 1830s, as an 1828 map shows very little evidence of quarries, and everything seemed to be over by 1840 or so, when it became clear that the quarrying operations were undermining existing properties along High Street, as can be seen today by the need to prop up the garden walls.

But who was Samuel Worrall? There has been much confusion as the name seems to have included a series of people who passed the name from father to son. The most famous Samuel Worrall (1756–1821) was Town Clerk of Bristol from 1787–1819 and lived at Knole Park House. His father was another Samuel, and he is the Samuel Worrall who was a banker, secretary to the Merchant Venturers, and was famously duped by the mysterious Princess Caraboo, properly Mary Baker (1792–1864), who pretended to be an exotic princess from a foreign land and was looked after by the Worralls (Gutch, 1817; Fells, 2014). But this Samuel Worrall was dead before the Worrall Road quarries seem to have been operational, so it is likely his son, another Samuel Worrall or his brother, Henry Lechmere Worrall (1798–1872), had some role, but Henry had served in the army in India at least in the 1820s. Certainly, Samuel Worrall IV, as he is called by Nichols (2005, p. 2) enclosed two fields at the west of the Worrall Road in 1859, and caused some consternation locally because the land had previously been regarded as common land.

What is known is that the Bristol dinosaur, named *Thecodontosaurus antiquus* by Riley and Stutchbury (1836, 1842), was the first dinosaur ever named from the Triassic, and only the sixth dinosaur ever named anywhere in the world (Benton *et al.*, 2000; Benton, 2012). It was named from the isolated bones extracted by quarrymen from the Worrall Road quarries, seemingly only in the 1830s, and studied by many great palaeontologists in Victorian times and just after, including Thomas Henry Huxley, Othniel C. Marsh,

and Friedrich von Huene, the last two visiting from the United States and Germany respectively. Many bones on display in Bristol City Museum were destroyed in the fateful World War 2 bombing in December 1940. Nonetheless, enough survives, and more has been collected since (Balle *et al.*, 2020), to show this is a remarkably important dinosaur, rather primitive in terms of the evolution of the large plant eaters, maybe only 2 m long, bipedal, and quick on its feet. In the latest Triassic, when this dinosaur lived, the whole Bristol area consisted of limestone islands, lapped by warm, tropical oceans, and *Thecodontosaurus* and other small reptiles, and even some very early mammals, lived on the islands, and perhaps occasionally swam from island to island. *Thecodontosaurus* has been adopted as Bristol's own dinosaur and forms the basis of an active outreach and engagement programme called 'The Bristol Dinosaur Project' (Benton *et al.*, 2015).

Walk up the Quarry Steps, turn left on High Street, and walk up to Upper Belgrave Road. Turn right and cross the two carriageways at the traffic lights. Walk onto the Downs.

14. The Downs

This quarter of the Downs is now (more or less) level grass, but until the mid-nineteenth century there was a variety of mineral workings. From the 1830s onwards, the private exploitation of the Downs was much debated, with many citizens complaining about the mess and damage and the loss of a remarkable asset. This all came to an end with the passage of the 1861 Clifton and Durdham Downs (Bristol) Act in Parliament, and the Downs became a public asset after that date (Nichols, 2005).

The Downs Committee was established, and still operates the Clifton Downs and Durdham Downs for the benefit of the public. In 1861, their priority was to make the area safe and to fill all the pit holes and quarries that had accumulated over the previous 100 years (Fig. 6). At the point of entry to the Downs was the large Chain Quarry, and beside it the series of linear diggings called 'The Dumps'. Two further large quarries, labelled 'Quarry 1' and 'Quarry 2', are marked (Fig. 6) and now entirely filled and levelled. You can still see elongate pits covered in scrubby bushes on the site of 'The Dumps' workings, where several firms operated to extract lead from galena-rich veins. The larger quarries were for limestone, used, as we have seen, for building some houses, commonly for garden walls throughout Clifton, and Bristol more generally, and for road foundations (Savage, 1999). Nichols (2005, p. 15) notes that these two large quarries, each some 10 m deep and 4 acres (1.6 hectares) in area, were still open and unfenced in 1859 (Fig. 5C). After the 1861 act, quarries 1 and 2 and the Chain Quarry were fenced. The quarry at the top of Pembroke Road was made safer to operate by building a tunnel into it.

From 1867–1873, there was an extraordinary operation to fill the large quarries with sludge and rocks generated by excavations of the Cumberland Basin in Bristol Docks. A railway system was laid along the Avon Gorge from the Docks, round to the Tennis Court, or Great, Quarry, and then brought up an incline, using a huge engine to haul the waggons, and then across the Downs, along the Dock Improvement Spoil Tramway to Quarries 1 and 2 and the Chain Quarry (Fig. 6). Some traces of these works can still be seen today.

Finally, walk eastwards along Upper Belgrave Road (A4176) as it transforms into the A4018, and pass the old St John's School on the right, past the roundabout and onto Redland Hill. Enter the grounds of the Spire private hospital down the road on the left.

15. The Spire

For many years, the hospital in the quarry was called The Glen, and this name is frequently applied to the site. This quarry somehow survived the sludge and boulders and was bought by local residents in 1871 and converted into a pleasure garden (Nichols, 2005, p.

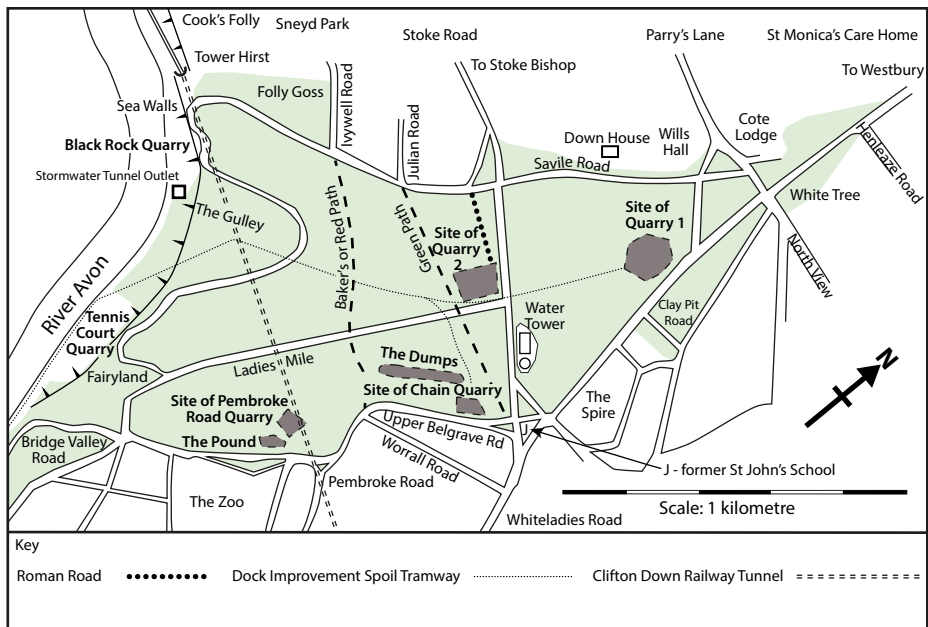


Figure 6. Map of the Clifton Downs, showing sites of the main quarries and lead workings ('The Dumps'), as well as the tramway used in 1867–1873 to distribute sludge and rocks to fill three of the original large quarries. Based on a map in Nichols (2005). (Drawing by Susan Marriott.)

15). This was home of Tiffany's Dance Hall and a milk and coffee bar that were popular with young people in the 1950s and 1960s.

Walk round the car park area to the east and south of the hospital building and look at the walls cut through Carboniferous Limestone. At places, under the ivy, thick beds of limestone are clearly seen, and dips can be measured. This quarry gives an idea of the scale of former quarrying operations in all the limestone quarries on the Downs.

Walk back out of the site, cross the road at the zebra crossing and walk some 800 m down Whiteladies Road to the Clifton Down station.

16. Clifton Down Station

Turn right into the station yard opposite Imperial Road. The station was opened in 1874 by the Great Western and Midland Railways, on the route between Bristol Temple Meads station (visited as part of the Bristol City building stones walk) and Avonmouth. The railway company made a substantial excavation to accommodate the station because the track bed lies some 5–6 m below road level. The deepest cutting is on the north side, along the back of the houses on Whatley Road, and a substantial set of sidings fanned out to the south, across to the houses on Alma Road. This marshalling yard has subsequently been built over by the Clifton Down Shopping Centre and houses on Alma Court behind.

The substantial station buildings on the north side, and the high walls on both sides of the station platforms are built from Pennant Sandstone with Bath Stone edgings around doors, windows and corners. These buildings now operate as a pub. The stone must have been brought into the site, because the excavations are in soft, yellow Triassic sandstones, which appear to have been recycled as building stones for the tall Victorian houses above,

lining the south side of Whatley Road, including Canynge Hall at the east end, the former Imperial Hotel, as well as other buildings around this part of Clifton.

References

- Andrews, A. & Pascoe, M. 2008. *Clifton Suspension Bridge*. Broadcast Books, Bristol, 50 pp.
- Ballel, A., Rayfield, E.J. & Benton, M.J. 2020. Osteological redescription of the Late Triassic sauropodomorph dinosaur *Thecodontosaurus antiquus* based on new material from Tytherington, southwestern England. *Journal of Vertebrate Paleontology* online ahead of print (doi: 10.1080/02724634.2020.1770774).
- Benton, M.J. 2012. Naming the Bristol dinosaur, *Thecodontosaurus*: politics and science in the 1830s. *Proceedings of the Geologists' Association*, **123**, 766–778.
- Benton, M.J., Juul, L., Storrs, G.W., & Galton, P.M. 2000. Anatomy and systematics of the prosauropod dinosaur *Thecodontosaurus antiquus* from the Upper Triassic of south-west England. *Journal of Vertebrate Paleontology*, **20**, 77–108.
- Burnside, A. 2009. *A Palladian Villa in Bristol: Clifton Hill House and the People who Lived there*. Redcliffe Press, Bristol, 136 pp.
- Christopher, J. 2014. *Brunel's Bridges: Clifton Suspension Bridge 150th Anniversary*. Amberley Publishing, Stroud, 96 pp.
- Fells, M. 2014. *The A–Z of Curious Bristol: Strange Stories of Mysteries, Crimes and Eccentrics*. The History Press, Cheltenham, 126 pp.
- Gutch, J.M. 1817. *Caraboo. A Narrative of a Singular Imposition, Practised upon the Benevolence of a Lady Residing in the Vicinity of the City of Bristol*. Baldwin, Cradock and Joy, London, 68 pp.
- McIlwain, J. 1996. *Clifton Suspension Bridge*. Pitkin Guides, Andover, 32 pp.
- Nichols, G. 2005. 'To keep open and unenclosed': the management of Durdham Downs since 1861. *Bristol Branch of the Historical Association, Local History Pamphlets*, **116**, 1–40.
- Pevsner, N. 1973. *The Buildings of England: North Somerset and Bristol*. Penguin, London, 514 + 396 pp.
- Riley, H. & Stutchbury, S. 1836. A description of various fossil remains of three distinct saurian animals discovered in the autumn of 1834, in the Magnesian Conglomerate on Durdham Down, near Bristol. *Proceedings of the Geological Society of London*, **2**, 397–399.
- Riley, H. & Stutchbury, S. 1840. A description of various fossil remains of three distinct saurian animals, recently discovered in the Magnesian Conglomerate near Bristol. *Transactions of the Geological Society of London, Series 2* **5**, 349–357.

Savage, R.J.G. 1988. Building stones of Clifton. *Proceedings of the Bristol Naturalists' Society*, Series **48**, 85–104.

Savage, R.J.G. 1999. Mines and quarries of Clifton. *Proceedings of the Bristol Naturalists' Society*, Series **59**, 65–76.

Stonebridge, E. 1999. *Bristol Heritage in Stone*. Thematic Trails, Oxford, 40 pp.