THE BUILDING STONES OF HELSTON

An urban geology walking tour

Written by Ruth Siddall with contributions from Beth Simons, David Paton and Nick Collins

CAST

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WATER AND STONE / DOWR HA MEN

In this booklet urban geologist Dr Ruth Siddall offers a guided walking tour around the historic town centre of Helston, looking back into the deep geological past of the building stones used to form the town's exceptional built heritage. The most southerly town in England, Helston has a remarkable concentration of fine buildings, made mostly from locally sourced materials, preeminently granite from the Carnmenellis area between Helston and Redruth and the descriptively named Helston Greenstone, but also including stone from much further afield.

Ruth Siddall's text incorporates references to the industrial history and traditional masonry skills that have contributed to this heritage and to Helston's distinctive sense of place, focusing not only on Helston's prominent buildings but also on the town's fine pavements, its walls and water channels (known locally as 'kennels') – all products of a long-sustained relationship between geology and industry.

This guided tour has been developed from a walk devised as part of the first *Water and Stone* programme, which was organised in association with Helston's annual celebration of traditional skills, *Helston Makes It!* (initiated by Helston resident Jude Carroll and the Museum of Cornish Life). In addition to Ruth Siddall's keynote address and guided tour, *Water and Stone* included talks by artist and granite worker Dr David Paton, geologist Dr Beth Simons, architectural conservation expert Nick Collins and artist Richard Wentworth, with demonstrations by stone mason Jamie Pharoah. The talks are documented on the CAST Cornwall YouTube channel and can also be accessed at: **castcornwall.art**

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geologistsassociation.org.uk

INTRODUCTION

Rocks and minerals have been a major economic resource in Cornwall from the Bronze Age onwards. Helston's location, just south of the Carnmenellis Granite and surrounded by tin mines, as well as its close proximity to the harbour of Porthleven and the waterways of the Helford River, has meant that it has been established as a settlement for well over a thousand years. In 1305, Helston was granted, under Royal Charter, the status of a Coinage Town, a centre for assaying and claiming revenue on tin. This period of development is responsible for the main layout of the town, centred around the marketplace crossroads of Coinagehall/ Wendron Streets with Church/Meneage Streets, although, apart from street names, very little survives from the medieval period.

The increasing productivity of local tin mines following the introduction of steam-powered pumping had direct architectural consequences for the town, in both public and private projects. The legacy of this time, c.1750-1840, is evident in the large number of buildings from this period throughout the town, and especially along Church Street and Cross Street, including St Michael's Church, rebuilt 1756-91.

The majority of buildings surviving today in the historic centre of the town date from the eighteenth and nineteenth centuries, although many of these are built within the original medieval plot layout and some with earlier fabric behind re-built facades.

As well as the arrangement of the main streets, a major defining feature of the town is the network of narrow pedestrian lanes – known as 'opes' – that wind off the main streets and the drainage channels — known as 'kennels' – that run along the sides of the streets. These, along with the use of primarily locally derived stone – Carnmenellis Granite and Helston Greenstone — for the buildings very much define the character of this town. The latter stone may be considered unique to Helston.

The geology of Cornwall strongly defines the area's history in terms of both heritage and building materials (see Bristow, 2013 a & b). Many local rocks are used as building and decorative stones in Cornwall,

representing the region's diverse geology. Some, and especially the granites, were exported across the British Isles and beyond as building and engineering stones. Others, outcropping in limited areas, were used only locally. The most important building stones in the region are the granites. Historically, Cornwall has been England's most important supplier of granite as a dimension (i.e. building) and engineering stone. In Cornwall, granite is frequently the principal stone used in many buildings, whereas in London and other British cities, Cornish granite was often used as a foundation stone, often paired with a Portland Stone superstructure. The Cornish granites, which typically have well-spaced, natural joint planes, could supply large blocks of hard, resilient and strong stone, which made it an important engineering material, especially in the construction of docks, lighthouses and bridges.

Granites are composed of three major rock-forming minerals: quartz, mica and feldspar. All three must be present to define a rock as a granite. Having said that, this combination of minerals can promote a large variety of colours and textures in the rocks, so not all granites look the same. Additional minerals such as tourmaline and topaz can also be present in granites, and particularly in the Cornish granites, which are additionally famous for their mineralisation, which is responsible for the tin and other metals (copper, tungsten etc) mined in the region. The Cornish granites are superficially similar in appearance and are generally pale grey in colour, but there are differences between them that can help locate the quarry from which stone found in a particular building originated.

Masses of granite, known geologically as 'plutons', are found in six main locations across Cornwall and Devon. From west to east these are the Isles of Scilly, Land's End, Carnmenellis, St Austell, Bodmin and Dartmoor Plutons. There are also a number of small intrusions known as 'stocks', which include the Tregonning-Godolphin, St Agnes, Cligga and Kit Hill Granites. Most of the granite intrusions have been exploited for building stone and they have been differentiated into five main groups (Simons et al, 2016, Fig. 1) which are mineralogically and chemically similar, with textural variations:

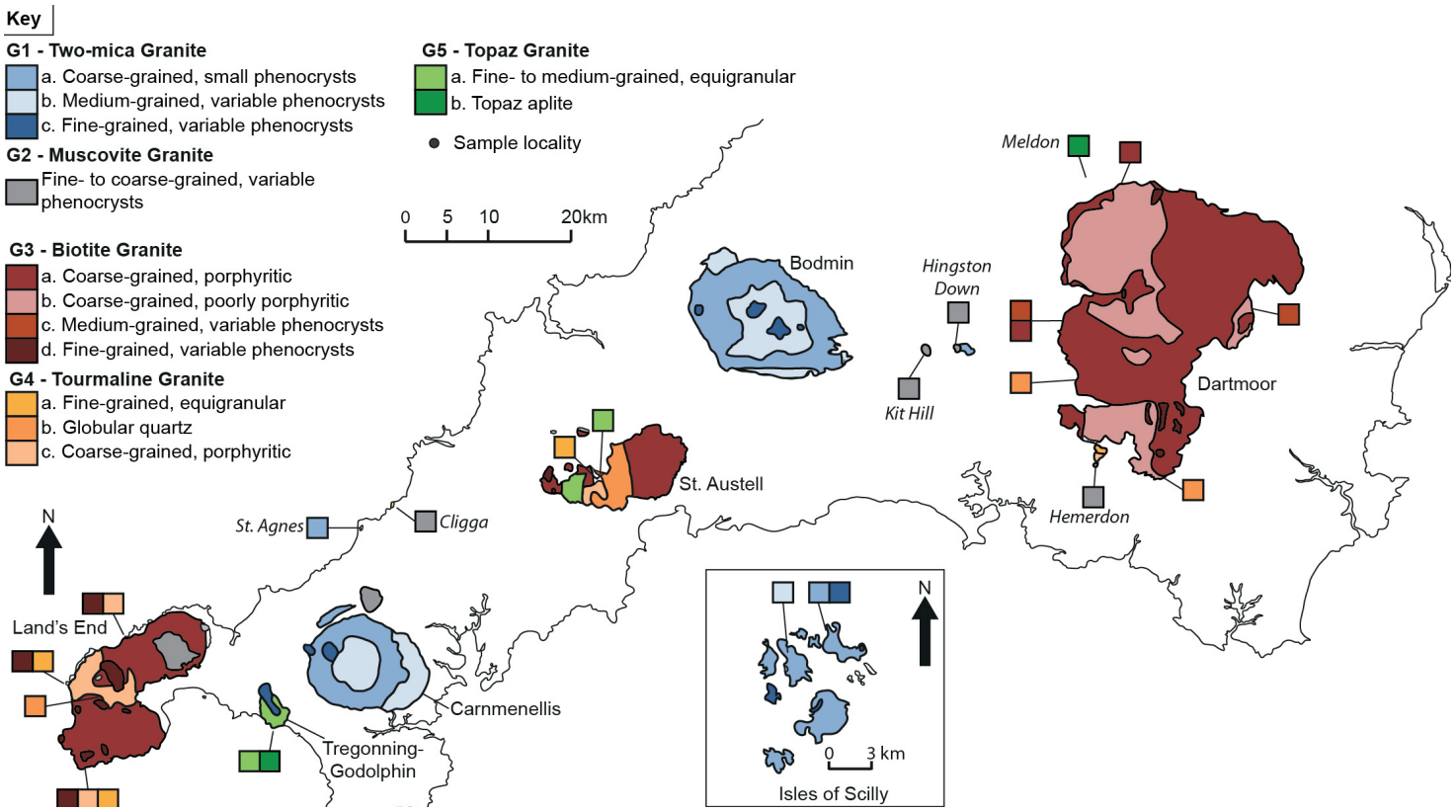

Figure 1. A map of the distribution of granite in Devon and Cornwall from Simons et al., 2016, compiled from Ghosh (1927), Exley and Stone (1982), Dangerfield and Hawkes (1981), Manning et al. (1996), Selwood et al. (1998), Müller et al. (2006). Contains British Geological Survey materials © UKRI 2016.

G1 Granites – two-mica granites (with black and white mica) and varying from coarse- to fine-grained are found on the Isles of Scilly and within the Carnmenellis and Bodmin plutons.

G2 Granites – muscovite granites are dominated by white mica. These are relatively uncommon and are associated with small intrusions such as Cligga and Kit Hill.

G3 Granites – biotite granites, which are dominated by black mica and are generally coarse-grained, often have very large feldspar crystals called phenocrysts. These are typically found within the Land's End and Dartmoor plutons and about half of the St Austell Granites are of this type.

G4 Granites – tourmaline granites contain abundant tourmaline, which is generally black in colour. These are found in the Land's End and St Austell plutons as well as in certain areas of the Dartmoor Granite. They show considerable textural variations, from fine- to coarse-grained, with and without phenocrysts, and with rounded grey quartz (the globular quartz variant).

G5 Granites – topaz granites, which contain abundant topaz, tend to be pale yellow in colour. This type of granite is relatively uncommon, occurring in the small Tregonning-Godolphin pluton to the west of Helston and as patches in the St Austell Granite.

The granites were intruded over a period of 25 million years, ~275-300 million years ago, into pre-existing rocks which are in the majority sandstones and shales, now converted to slates. These were generically known by Cornish miners as 'killas' and this word has entered geological terminology. Killas is definitely a lower quality building stone than granite and suitable only for rubble masonry rather than squared-off 'ashlar' blocks. Nevertheless it is used for local building and walling throughout Cornwall. In some towns, such as Redruth, it is an important building stone. Here in Helston, the local killas, the Mylor Slates, are rather soft and friable and less suitable for building. In addition to the large bodies of granites, the killas is intruded by small igneous intrusions which form sheet-like bodies cross-cutting both killas and occasionally the granites too. Some of these are granitic and others have a completely different chemistry and are called dolerites. Unique to Helston are the 'epidiorites', altered doleritic rocks which once outcropped throughout the town (see Flett *et al.*, 1912). They are named after the abundance of a green mineral called epidote and they are also locally known as Greenstones. Some of these rocks, of both chemistries, have found local importance as vernacular building stones and are seen in a number of buildings in Helston.

Another miners' term, 'elvan', is used to describe small-scale and generally granitic intrusions that are found across Cornwall, cross-cutting killas and the granites themselves. The term 'elvan' means spark stone, so is also applied to non-granitic rocks that generate a spark when struck with a hammer. The granitic elvans, or quartz porphyry, contain the typical granite minerals of quartz and feldspar, but have a distinct texture, with rounded quartz and/or tabular feldspars in a fine-grained groundmass. Close to Helston, elvans are found at the western end of Praa Sands and close to Trewavas Head. Elvans have been used across Cornwall as building stone, with variable success owing to their diverse nature – some are friable and break down when exposed to the weather, others have similar properties to the granites and are similarly hard-wearing.

South-east of Helston, on the Lizard Peninsula, is Britain's largest outcrop of a rock type known as serpentinite. These rocks have been

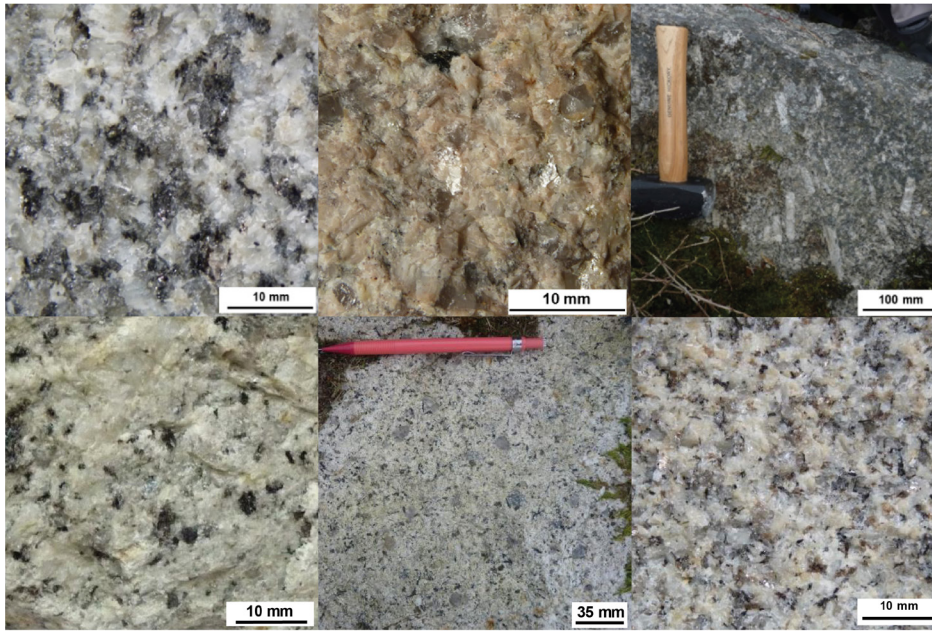

Figure 2. Textures in Cornish granites. The term 'texture' refers to the grain-size, shape and orientation of minerals in a rock, which gives it its overall fabric. Clockwise from top left: G1 from Carnmenellis, G2 from Hemerdon in the Dartmoor Pluton. Similar varieties are found in the Land's End Granite and the quarried stock at Kit Hill. G3 Land's End Granite with large phenocrysts, G5 topaz-bearing Tregonning Granite, G4 Land's End Granite with globular quartz and G4 granite from St Austell.

locally exploited as dimension stone on a small scale, but have been used mainly as decorative stone for building interiors and ornaments. Serpentinites have an unusual origin; they represent the base of the Earth's oceanic crust and top of the mantle and are dominated by serpentine-group clay minerals and iron oxides. They are soft, colourful stones and capable of taking a good polish, which makes them very attractive materials. These stones are widely used across the British Isles for ecclesiastical trappings such as fonts (as found in St Michael's Church in Helston), but also as small columns, balusters and other forms of decorative stonework including ornaments.

Helston town's proximity to the extensive dimension granite quarrying district of Carnmenellis is evidenced throughout its architectural

infrastructure. Here one might observe how the many quarried voids distributed across the nearby landscape find their reciprocal 'positive' in the many buildings and features of the town, including the impressive Grylls Memorial and the Guildhall. Industrial quarrying for granite really began to develop in Cornwall from the 1800s onwards, prior to which much stone extraction and working was taking place on the surface.

Trenoweth Quarry near Mabe Burnthouse is an important example of a quarry still working Carnmenellis granites. On the eastern edge of the district that began operating fully in the 1840s, it remains one of the last operating quarries using traditional masonry techniques. Trenoweth's vernacular name for its granite is 'Buckle and Twist', a name that is suggestive of its twisting bluey-grey, very hard, fine-to-medium-grained matrix. In addition to architectural products, Buckle and Twist was notable for its high polish capabilities and was used extensively for the monumental and memorial trade. Today, under T. Marsh Ltd., the quarry extracts only occasional block, but produces a huge array of architectural and sculptural products using local granites, with recent projects including the restoration of and improvements to the Grylls Monument in Helston.

A dimension stone quarry such as Trenoweth relies on the wide spacing of the natural vertical and horizontal joints in order for it to provide good-sized blocks. The traditional quarrying processes used at Trenoweth to produce stone for building would have started in the quarry pit, where the quarrymen would utilise the naturally emplaced jointing to facilitate the removal of blocks. Here holes would be drilled – for example with a hand-held swell-jumper prior to the widespread pneumatic mechanisation of the early 1900s – and black powder was compacted into the holes and ignited. Black powder, made from a mix of charcoal, saltpetre and sulphur, would provide sufficient force to shunt the block from its bed, but not enough to generate fractures. The block would then be turned so that the grain way or cleaving way sat vertically – rather than horizontally in the bed – and would then be stitch-split using plugs and feathers until it was close to the required dimension. At Trenoweth, until fairly recently, the remains of a wooden derrick crane could be seen near the mason's banker sheds. When fully operational this derrick would have lifted the split blocks up from the quarry pit for dressing. It is worth noting here that today the forklift truck is a vital element in the day-to-day work of manoeuvring granite. The masons then shape the rough granite according to the job specifications, using a range of hand tools such as a punch (pointed chisel) and a three-pound hammer – tools, by the way, that remain in use by the masons at Trenoweth today. Before the advent of tungsten-tipped chisels the steel tooling was tempered by the quarry blacksmith, with a constant back and forth flow of chisels being sharpened and reused. The blacksmith would likely temper the hardness of the chisel not only according to the granite, but primarily to the unique hitting technique of the individual mason. Today at Trenoweth the traditional skills of masoning are well established and used every day, along with the use of tungsten chisels, diamond saws and pneumatic drills that, together with a skilled and dedicated quarry team led by Tim Marsh, can turn a 25-tonne rough block into a lintel, an intricate pier cap, a Cornish Cross or a five-metre-tall sculpture of St Piran.

A map of the walk showing the locations of each building or feature mentioned can be found at the end of this booklet.

A helpful visual guide to the main varieties of stone found in Helston's built heritage can be found on page 37.

THE WALK

This walk aims to demonstrate the range of building stones used in Helston within the context of the architectural history of the town. It starts at CAST and from there will explore the town of Helston, taking in both local and imported building stones.

1. CAST (Cornubian Arts & Science Trust)

Originally the Passmore Edwards Science and Art School, the building now owned by CAST provides studios for artists, a café, a ceramics studio, and a range of spaces for screenings, workshops and other arts activities. The first section of the building, designed by architect James Hicks, was built between 1889 and 1897, with further extensions added in the same architectural style in 1905 and during 1913-14 (Beacham & Pevsner, 2014).

The building is constructed of two types of stone. The main pink- to brown-coloured building stone is Tremore Elvan and the stone used

for the end gables and rear of the building, and to dress the windows, doorways and the inscribed plaques, is the local Carnmenellis Granite.

The Tremore Elvan is an important local building stone. It was used in a number of later-nineteenth-century buildings throughout the towns of Cornwall and was even used at Queen Victoria's Osborne House. It is a porphyry, a very hard stone, defined by having distinct, larger crystals set in a fine-grained matrix. Overall this stone varies in colour from liver red to pink and red brown. Look closely and you can see that it is speckled with crystals of white feldspar just 3 to 5 millimetres in size, and distinctive clots or 'suns' of black tourmaline. 'Elvan' is a local Cornish word that has entered the language of geology. Generically, these rocks belong to a group of igneous rocks termed 'felsites', meaning that they are composed dominantly of feldspar and quartz (silica). These are granitic rocks which were intruded several million years after the main granite plutons with which they are associated. They are in the form of dykes, i.e. a sheet-like body of rock which cuts across the pre-existing strata. The Tremore Elvan is an East-West trending elvan, exposed for at least two kilometres in the Tremore Valley located to the south west of Bodmin. The dyke was around five metres wide and quarried in several places around the hamlets of Withiel and Tremore.

Quoins and dressings on the building are a contrasting grey granite. Look closely and it is clear that this is packed with small, white, brick-shaped crystals of the mineral feldspar. This is a two-mica (G1) type granite, typical of the Carnmenellis Granite, with crystals of both black and silvery white mica, the latter catching the light on sunny days. The third essential mineral in granite is quartz and this is the grey, glassy mineral present. The granite blocks are very nicely dressed, with chamfered margins and axe-dressed faces.

Turn right out of the CAST building, walk up Penrose Road and turn right to the junction with Wendron Street. Opposite is the historic Robert Fitzsimmons's house.

2. Bob Fitzsimmons's House

Much of the domestic architecture on Wendron Street is built from Helston Greenstone, a building material that is more or less unique to Helston. The house once occupied by Robert Fitzsimmons (1863-1917), a professional boxer who was the sport's first three-division world champion, successively winning the middleweight, heavyweight and light-heavyweight titles, stands out with its thatched roof and blue plaque. It was constructed in the eighteenth century. Although he spent most of his life in New Zealand and Australia and died in Chicago, Fitzsimmons was born in Helston and lived in this house until he was ten years old.

The building stone is a mottled, grey-green stone, which is variably affected by rusty brown iron staining. Geologically this rock is an epidiorite, which occurs locally as sheet-like, doleritic intrusions in the local bedrock, the Mylor Slates. As a building stone, it is best described as Helston Greenstone. These strata are of Devonian age, though they are not securely dated, and the epidiorites post-date them, but probably not by much. We can assume that they are of Devonian to early Carboniferous age. These intrusions outcrop in a cluster around the town, but quarries are largely worked out or back-filled (or both)

and have subsequently been built upon. These greenstone 'bands' are now best seen on Porthleven Sands where they outcrop in the cliffs and beach surrounding the harbour entrance. These localised outcrops have furnished many of the buildings of Helston with a unique and local building stone which very much adds to the character of the town.

The thatched roof is a rare survival in the town. Thatch would once have been a common roofing material. An example also survives at the Blue Anchor on Coinagehall Street (see below).

Walk down Wendron Street to the imposing Godolphin Club on the right-hand side of the road.

3. The Godolphin Club

Established as a members club for the residents of Helston, the bespoke 'Godolphin Hall' Building, with meeting rooms, function rooms and school rooms, was completed in 1889. Geologically, it is a building of two faces.

Viewed from the car park to the north of the building (behind CAST), the Godolphin Club is very much part of the local vernacular, with a coursed rubblestone wall of rusty Helston Greenstone and quoins of local Carnmenellis type G1 two-mica granite. Both the black and silver white mica are clearly visible in these stones, along with the large, white, brick-shaped feldspars. On the front of the building, the use of granite ashlars carries through in window dressings and the porch. A band of Greenstone is used to separate the ground and first storeys. A sandstone or sandy limestone appears to be used in part for the window dressings in the upper floors, but unfortunately these are not identified as it has not been possible to inspect them at close quarters. The material is possibly Bath Stone. However, the main façade of the building, facing Wendron Street, is built from grey Plymouth Limestone. The most distinctive feature of the rock is the white veining, known as 'flashing' to quarrymen and builders, which is formed of the mineral calcite. The stone itself is rain-weathered, but look carefully and scattered fossil corals can be seen.

The more you look, the more you see! This stone is widely used in Plymouth and was quarried from within the town at Radlett and Pomphlett Quarries in Plymstock. It is of Devonian age, about 385 million years old, and, although laid down in calm, tropical seas, once transformed into the limestone rock it was deformed and fractured by the mountain-building events that accompanied the intrusion of the Cornish and Dartmoor granites.

Continue down Wendron Street to the junction with Meneage Street.

4. Market Place, former Lloyds Bank and the Guildhall

Helston's small Market Place joins Wendron Road to Coinagehall Street and is the site of some of the town's most important buildings, particularly the Guildhall and the former Lloyds Bank, all primarily constructed of the local Carnmenellis Granite (G1 – two-mica granite). The bank building demonstrates a number of ways of dressing granite, with a weighty foundation course of axe-dressed stone and upper storeys of ashlar masonry.

Helston Guildhall is a formidable building, erected in 1838 with a classical façade by architect William Harris of Bristol (Beacham & Pevsner, 2014). It is a solid, granite building, constructed in a neoclassical style that does not lend itself immediately to this building material. Once again local Carnmenellis Granite (G1 – two mica granite) is used as the main building stone, quarried and dressed locally.

The triangular pediment holds a clock and a sculptural group, featuring collective dragon slaying, carved in what is reputed to be Portland Stone, though, according to Pevsner, it is Bath Stone (Beacham & Pevsner, 2014). Unfortunately, it is too far above eye-level for the provenance of the stone to be confirmed. It is certainly carved from a Jurassic, English, oolitic limestone, but the jury remains out at this stage as to whether it is Bath or Portland Stone. The greyish colour suggests the latter.

Quarried on the Isle of Portland in Dorset, Portland Stone has become England's iconic building stone. It became the most important building stone in London following the Great Fire in 1666 and has continued in use as the stone used to build monumental and civic buildings in the capital, as well as being widely used for similar structures across

the British Isles and indeed the Commonwealth. Portland Stone is an oolitic limestone of late Jurassic age. Oolitic Limestones, or 'oolites', are composed of particles called ooids. These are millimetre-diameter, spherical particles which accumulate in tropical lagoons. Close inspection with the naked eye, and even better with the aid of a magnifying glass, will reveal these tiny balls of calcium carbonate in the stone. The great property of Portland Stone is that it is a freestone; it shows no particular planes of weakness and therefore can be carved into intricate sculpture and decorative features, as observed here. Bath Stone, though slightly geologically older than Portland, being middle Jurassic, is also an oolite but it is more golden-yellow in colour than Portland Stone. Nevertheless, it has similar properties and is used for many of the same purposes.

From Market Place continue down the hill onto Coinagehall Street.

5. Former Barclays Bank

On the west side of Coinagehall Street is the former Barclays Bank,

an imposing building constructed, like CAST's premises, from pale pink Tremore Elvan and grey Cornish Granite. The sunburst clots of tourmaline are clear to see in many of the blocks of elvan. Once again, the granite is local, a G1 type granite from the Carnmenellis pluton. The occasional xenolith – a piece of country rock incorporated into the mass of granite – can also be seen. The bank was constructed in 1933, though its design was inspired by eighteenth-century townhouses (Beacham & Pevsner, 2014).

6. 25-27 Coinagehall Street

Originally built as a grand townhouse, 25-27 Coinagehall Street was best known in Helston as Trelawney's Bar and Club, but, at time of writing, had recently closed. This solid building, dating to the late-eighteenth or early-nineteenth century, has a fine, probably Edwardian, shop front, with diamond-patterned leaded-light top lights fitted on the ground floor. The main building stone here is the Helston Greenstone seen at Robert Fitzsimmons's house and the Godolphin Club. Here it is cut into finely fitted, coursed ashlar masonry. Quoins and window dressings are in granite, but this time we have an example of the G5-type topaz-bearing granite. This stone would have been quarried locally from the small Tregonning-Godolphin intrusion located just to the west of

Helston. This granite is paler in colour than the more commonly used Carnmenellis Granite, as well as being texturally and mineralogically different. It has a more even and medium-to-fine grain size and is speckled by greenish crystals of topaz and apatite, as well as the standard composition of quartz, mica and feldspar. Like the Greenstone, this granite variety, which is relatively rare throughout the Cornubian Batholith, is typical of Helston and its surrounding area. The quarries were on the lands of the Godolphin family and this variety of granite was also used for the construction of the nearby early-seventeenth-century Godolphin House.

7. 31-33 Coinagehall Street

This building, originally constructed as a branch of Woolworths, has the blocky, mid-twentieth-century architecture typical of these stores. It is worthy of note geologically for the black, polished igneous rock used to clad the shop front. This is a stone imported from Larvik in southern Norway and named 'larvikite' after the town where it is quarried. Geochemically, it is an unusual stone, known as a 'monzonite'. Unlike granite, it does not contain quartz, but it does contain feldspar and black biotite mica. The feldspars are distinctive and have very much led to the popularity of this stone in buildings worldwide. Look closely and you will see that they are iridescent, catching the light and flashing shades of blue-green. Larvikite has been quarried since the 1880s and it is Norway's 'national stone'.

8. Wesleyan Chapel

Almost opposite, on the left (east) side of Coinagehall Street, is the Wesleyan Chapel, built in 1889 by architects Bentley & Woodhouse of Bradford (Beacham & Pevsner, 2014). This building uses a wide range of stones compared with many other buildings in the town. Here we see polished columns of Peterhead Granite, Plymouth Marble ashlar masonry and dressings of Cornish Granite. Peterhead Granite comes from Aberdeenshire and was quarried from coastal quarries at Stirlinghill, just to the north of the fishing port of Peterhead. It is a very distinctive pink granite, quite different in character from the

Cornish granites. The colour is imparted by salmon-pink crystals of feldspar, the quartz is grey and the stone is flecked with flakes of black biotite mica. Peterhead granite was plentiful. It takes a good polish and was easily exported from the quarries by sea and then, from the later nineteenth century, by train. This made it an immensely popular granite for structures such as statue plinths and drinking fountains, and for decorative dressings such as these small columns. The city of Aberdeen, famous for its masonry workshops, was probably the first port of call for the granite; it would have been here that it was shaped into columns and polished before being sent south.

Grey Plymouth Limestone is again used as the main building stone, as previously seen on the Godolphin Club. It takes a while to get one's eye in, but inspection will reveal masses of solitary and colonial coral fossils preserved in this rock; in some cases these are highlighted by the rusty, iron oxide rich alteration of the matrix. Once again, Carnmenellis Granite (G1 – two-mica granite) is used for quoins and dressings.

9. Blue Anchor Inn

Towards the lower end of Coinagehall Street is probably one of the oldest buildings in the town. The Blue Anchor Inn has a ground plan possibly dating to the fifteenth century, but was certainly largely rebuilt in the eighteenth century (Beacham & Pevsner, 2014). It is solidly constructed, with foundation courses that extend up to the door lintel of large blocks of Carnmenellis Granite and an upper story of the local Greenstone. As at Bob Fitzsimmons's House (61 Wendron Street), the roof is a rare survival of thatch in the town.

Walk to the lower end of Coinagehall Street.

Coinagehall Street. The entrance to Lady Street is on the left and the kennel running down this street can be seen to the right of the pavement. The granite paving here is grooved to provide both decoration and resistance to slipping.

10. Grylls Monument

This Gothic arch is a superb example of Cornish granite's properties as a freestone, that is a stone that is homogenous and can be cut in any direction without revealing any weakness. The monument was constructed in 1834 in memory of Humphrey Millet Grylls, who died that year. It was designed by architect George Wightwick of Plymouth. Grylls was a prominent resident of Helston, who was instrumental in keeping local banks and his tin mine, Wheal Vor, open during the recession of 1830 and thus saving the town from financial catastrophe. According to Helston History (2022), 196 tonnes of the finest quality local granite was used to build the monument by the contractors, John Eva & Sons.

In 2016 repairs and improvements were made to the Grylls Monument. T. Marsh Ltd of Trenoweth Quarry near Mabe Burnthouse were commissioned to carry out the work of specialised masonry improvements and restoring some of the finely carved elements. Ernie Hillson, a highly regarded and skilled granite mason working at Trenoweth, was asked to carve a replacement for a damaged and worn finial. In the making of the finial, granite of a similar fine-to-medium grain silvery-grey was used, and, through a combination of templates, the outline form was worked from a 'squared' block on two axes, using saw-work and pneumatic tooling. Once the outline tiered structure was established, the detailing, copied from the original, was slowly and carefully carved across the surface. Ernie Hillson used a range of fine pneumatic chisel work to gradually reveal the various mouldings in each

tiered section, with a very fine axe finish applied to the finial's surface. Fine-axing is a traditional term for a vertically-aligned visibly chiselled texture on granite carving and masonry, providing a means to render an even surface across the matrix of differing densities of quartz, feldspar and mica, and giving the masonry a lively and practical hand-worked appearance.

Walk down Nettles Hill.

11. Nettles Hill

The narrow lane of Nettles Hill is largely residential property, but it is of geological interest because here we can see the local bedrock, the metamorphic Mylor Slates, in a natural, geological outcrop. These outcrops are small and often form the foundation course of the terraced cottages (for example, behind the drainage pipes next to the Old School House). Slates are defined by a geological phenomenon known as 'cleavage' which allows the stone to be broken into roofing slates. Here the cleavage is very clear, dipping towards the east. Otherwise this is a dark grey, very fine-grained stone, often covered with a pale grey-green lichen.

Continue down Nettles Hill, turn right into Lady Street and continue on to Five Wells Lane. Before the building of the 'New Road' to Penzance in 1838 that re-routed Coinagehall Street down the newly formed Monument Road, Lady Street would have been one of the key routes into the town centre from the west.

12. Five Wells Lane

The wall on the left-hand-side (north side) of Five Wells Lane forms the boundary to the large gardens of Lismore House in Cross Street. This wall is constructed of the rock we have just seen in outcrop in Nettles Lane, the locally outcropping Mylor Slates. Despite the stone being out of context, these walls reveal more detail about the nature of the slates.

We can see that these rocks were once sandstones and mudstones. Sandy layers show up as yellowish bands within the grey mudstones. These sandstones and mudstones have been transformed into slates due to the processes of metamorphism, which has allowed some recrystallisation of original minerals occurring in the rock and also, importantly, realignment of these minerals. Metamorphism is driven by burying and heating the rock within the Earth's crust and, in this case, also subjecting it to deformation. It is this particular process that is responsible for the slaty cleavage. Nevertheless, the metamorphism was not strong enough to erase all the features of the original rock, which is why we can still discern the original bedding features. It is also very noticeable that the slates used in the wall are quite soft and crumbly and therefore, despite their strong cleavage, not particularly useful as roofing slates.

13. Former Woolworth's building

A small car park opens off the right-hand-side (south side) of Five Wells Lane, giving access to Jose Collins Mews. This space allows a view of the rather imposing and featureless rear wall of the former Woolworths building. This is clad in Delabole Slate, an important roofing stone and one that was exported further afield. Apart from being much harder than the local Mylor Slates, Delabole has an almost silvery, silky appearance on its riven surfaces. However it is this stone's resilience to the elements that makes it a far better slate than the local Mylor Slates. Delabole Quarry is located between Camelford and Tintagel on the north coast of Cornwall and has been producing slate for over four hundred years. Not surprisingly, it is now a substantial hole in the ground, over 130 metres deep and with a circumference of two kilometres. It is still producing high quality slate today.

14. Five Wells and Wheelbarrow Ope

The eponymous Five Wells is encountered about halfway along the lane. This water feature is slightly below street level, with enclosing walls of local granite and slates. Granite is also used for edging the rills along which the water flows. However the rest of the basin is paved with cobbles of a white and pink, quartz-rich rock known generically as veinstone. Veinstone is also used for cobble paving in many of the narrow lanes, known as 'opes', in this part of the town. Indeed large blocks are used in the nearby Wheelbarrow Lane. Veinstone is essentially the waste product of metal mining and would have been an abundant local product from the local tin mines. Veinstone is exactly what it sounds like; it is mineral vein that is barren of economically valuable minerals (such as tin and other valued metal ores) and rich in low-value minerals such as quartz and pink, potassium-rich feldspar.

Veinstone, the waste product of metal mining which makes hard-wearing cobblestones that are used for paving in various localities in the town of Helston. It is best seen at Five Wells and outside the Band Room on Church Street.

Walk to the end of Five Wells Lane and turn left into Church Street.

15. Ancient Cross on the corner of Church Street and Cross Street

An early medieval, probably tenth-century or earlier, wheel-headed cross is located on the corner of Church Street and Cross Street, giving the latter its name. It is cut from the local Carnmenellis Granite and almost certainly predates large-scale quarrying; it was probably a field stone, collected from the surface, rather than a quarried block. The details of the cross, with its flared arms, have been incised into the surface. It is set into a very roughly cut block of granite.

16. The Willows

At the junction of Church Street and Cross Street, this fine, Georgian, bow-fronted house (now split into apartments) is built from an unusual combination of rock types, Bath Stone and Newham Stone, both of which were brought to Helston from further afield. The main building

stone, Newham Stone, is from Truro and is typical of the eighteenth- and nineteenth-century buildings of Cornwall's principal town. Newham Stone is a buff-coloured igneous rock, another variety of elvan. We have encountered elvan previously at the CAST premises and at Barclays Bank, but this elvan is evidently a very different type of stone. The term 'elvan' covers a broad range of geologically different, intrusive igneous rocks encountered in Cornwall. Newham elvan is very fine-grained and homogenous.

A superficially similar but very different stone is used for quoins, dressings and the balustrade. This is Bath Stone, which is a limestone and of Middle Jurassic age, significantly younger than the Cornish building stones. During the Jurassic period much of the area which is now the British Isles was flooded with shallow, tropical seas. A very distinctive limestone, called an oolite, forms in these conditions, and two of Britain's most important building stones, Bath Stone and Portland Stone, formed in such an environment. At the Willows, the nature of this oolitic limestone can be examined at first hand. In Bath Stone it is characteristic to see the surface layer of ooids weathering out, leaving tiny spheroidal cavities on the surface. This feature, as well as the warm golden colour of Bath Stone, makes it distinctive and differentiates it from Portland Stone. Stone has been quarried in Bath since the Roman Period and is still extracted today. Much of it is extracted from underground mines rather than opencast quarries. Stratigraphically it comes from the Chalfield Oolite Formation.

The Willows was originally a townhouse of 1776, with the bow windows added in the mid-nineteenth century (Beacham & Pevsner, 2014). It was heightened and extended in the twentieth century.

Continue up Church Street to the Band Room

17. Helston Town Band Room

The Band Room is another fine building constructed of the local Carnmenellis Granite, with paving of pink and white veinstone, as seen

at Five Wells, outside. The building bears a carved inscription which reveals that it was originally constructed in 1894 as the Boys National School. Construction on the façade facing the road is interesting, showing two contrasting ways of dressing the granite. The foundation courses are 'axe dressed', giving a rough surface that increases the appearance of weightiness and therefore strength of the granite. Smoothly dressed surfaces are used on the ashlar masonry in the upper courses. Granite is used throughout for the construction of this building, including the mullioned window dressings.

Cross the road to St Michael's Church.

18. St Michael's Church

The Parish Church of Helston, St Michael's, was built on the site of a medieval church, which itself occupied the site of an early Christian lann (a sacred enclosure). The medieval church, constructed in the fifteenth century, was destroyed by a lightning strike in 1727. The only evidence of this church is a small granite, wheel-head cross, which once stood at the gable end of the roof and now stands in the graveyard. The current

church, designed by Thomas Edwards of Greenwich, was completed in 1761 (Beacham & Pevsner, 2014). St Michael's Church is constructed from the now familiar local combination of Helston Greenstone and Carnmenellis Granite. The walls are built from Greenstone (with rather harsh, modern pointing, which is sadly increasing the weathering of this stone) and the foundations, porch, quoins and tower are constructed of Carnmenellis two-mica granite. The interior also displays some interesting stones. The font is carved from the rather soft Beer Stone, a form of Chalk quarried at Beer in Dorset. This is the same Chalk as that forming the White Cliffs of Dover, a stone that is usually too soft to use for building. At Beer, the Chalk is harder, a variety known as 'clunch', and it can be hard enough to be used for external masonry. The Chalk was laid down in the deep seas of the Late Cretaceous between 99 and 65 million years ago. The font is decorated with small columns of serpentinite, quarried nearby on the Lizard. A dark, red-veined variety of serpentinite is used here. The red colour is imparted by the presence of iron oxides and particularly the red iron oxide mineral hematite.

The new floor, installed in 2020, features a much more exotic stone (see

Siddall, 2021). It is worth getting down on hands and knees to inspect this stone as it is packed with fossils, which include the remains of sea urchins, the shells of single-celled organisms called nummulites, and rare fragments of dark-brown reptile bone. The nummulites are by far the most abundant fossils present. In life they would have formed coin-shaped disks and here on the paving they resemble sections through squashed onions. The echinoids (sea urchins) are white and illustrate sections through the dome-shaped shells of these sea creatures. The presence of the nummulites allows us to give an age to this rock. It is Eocene (around 47 million years old – by far the youngest rock that we have encountered in Helston's buildings). It comes all the way from Türkiye, from quarries near to the town of Safranbolu in north central Türkiye.

19. Henry Trengrouse Memorial

Henry Trengrouse (1772-1854) was a Helston man who achieved deserved fame for his invention of a 'rocket apparatus', which could fire a line to stranded ships from the shore and thus increase the chances of saving lives. He has an impressive memorial in St Michael's Churchyard, constructed somewhat incongruously from a white Carrara Marble and carved by Spargo, stonemason of Helston. This memorial, weathered and attacked by biology, is now a yellow-brown colour. With close inspection, traces of the white marble can be discerned through the surface patina and in the crevices of this carved monument. The carving itself is of interest. The monument takes the shape of a rock outcrop or wall, indeed a case of carving stone to make it look even more like … stone. Seashells and seaweed are also carved onto the marble. The front of the monument is carved with an anchor and chain and a scroll that tells Trengrouse's story. The marble monument sits on a plinth of local Carnmenellis G1-type granite.

Carrara Marbles are varied in colours and textures, but the most prized is the pure white variety, sometimes known as 'Luna' also known as 'Statuario'. This is the variety used here. The Carrara marbles were once limestones forming on an early Jurassic seafloor. They underwent metamorphism at the peak of Alpine mountain building around 30 million years ago. The metamorphic events that formed the Mylor Slates described above were relatively mild. In contrast, metamorphism in Tuscany subjected the Jurassic limestones to high temperatures and pressures, along with some significant deformation. These processes erased all traces of previous sedimentary features, such as bedding planes and fossils, and resulted in a hard, white marble. The Carrara marbles have been quarried since the Roman Period in the Massa and Carrara region of Tuscany in Italy.

To return to CAST walk back down Church Street, turning left into Penrose Street.

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Dr Ruth Siddall is a geologist specialising in the study of minerals and rocks used in cultural heritage. She has worked extensively on the characterisation and analysis of artists' pigments, ceramics and building materials, including mortars, bricks and stone. She is a co-author of *The Pigment Compendium* and is actively engaged in earth science-related outreach. She is currently collaborating in research studying materiality with colleagues at UCL Slade School of Fine Art. She regularly leads guided walks unveiling the geological sources of London's built heritage.

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USEFUL WEBSITES

Information on locations in Helston, including some not included in this guide, are presented on the London Pavement Geology website, available at **londonpavementgeology.co.uk/geo-sites/**

Information about the geology of Cornwall can be found on Dr Beth Simons's website Variscan Coast **variscancoast.co.uk**

Information about Helston's network of leats and kennels can be found on the Museum of Cornish Life's website **museumofcornishlife.co.uk/projects/wendron-leats-and-helston-kennels/**

As part of the Groundwork programme of international art in Cornwall (2016 to 2018), Dr David Paton, Dr Ruth Siddall and Dr Beth Simons collaborated on the project *Tracing Granite: In Search of a White Cross*, with funding from FEAST. For the Record section of the Groundwork website David Panton compiled 'A brief geology of granite and a note on working it' together with two granite glossaries, 'The geological glossary' and 'A Cornish granite-quarrying and masonry glossary'. **groundwork.art/tracing-granite/**

Talks given as part of the *Water and Stone* programme in 2021 and 2023 are documented on CAST's website **castcornwall.art/projects**

To explore and discover things to do and see in and around Helston visit **discoverhelston.co.uk /@discoverhelston**

Helston's building stones. Top row: left, Carnmenellis Granite, Tremore Elvan. Helston Greenstone. Bottom row: Plymouth Limestone. Mylor Slates, Delabole Slate.

Key

1. CAST
2. Bob Fitzsimmons's House
3. The Godolphin Club
4. Market Place and Guildhall
5. Former Barclays Bank
6. 25-27 Coinagehall Street
7. 31-33 Coinagehall Street
8. Wesleyan Chapel
9. Blue Anchor Inn
10. Grylls Monument
11. Nettles Hill
12. Five Wells Lane
13. Former Woolworths
14. Wheelbarrow Ope
15. Ancient Cross
16. The Willows
17. Helston Town Band Room
18. St Michael's Church
19. Trengrouse Monument


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