



# GEOLOGY AND HEDGES IN CORNWALL

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*Cornwall's geological structure / hedging stone / local geological diversity*

The origin of the stone-built Cornish hedge lies deep in geological history when the great layers of sedimentary rock, formed between 300 and 400 million years ago, were lifted out of the sea during a time of violent earth movement. The layers were buckled and tilted into crumpled folds, with volcanic upheavals forcing intrusions of molten magma up into these mountainous heaps from below. This heated and altered the already pressurised rock, injecting molten, chemical and gaseous matter and producing a vast and chaotic underground brew, slowly to cool into its different substances when the 'earth storm' finally passed. The once-level sedimentary rocks were now draped over the hardened volcanic peaks, like a gigantically crumpled bedspread.

This mountain range, which ultimately became Cornwall, is known to geologists as the Cornubian massif; estimates suggest that the 'bedspread' was a mile thick. Then 250 million



*Granite intrusion, exposed by weathering, forms rugged hilltop in West Penwith. Wooden stile is non-traditional in Cornwall and looks wrong in this granite landscape. Cornish hedges like this one should have stiles of the same local stone.*

years of weathering and erosion began, frost, wind and water breaking down and wearing away the softer sedimentary rock covering, and exposing the up-thrust hard igneous intrusions which in cooling had formed the granites. Today Cornwall shows the eaten-away core of the Cornubian massif. The intrusions are now the chain of granite hills from Dartmoor to the Isles of Scilly, each with its surrounding aureole of metamorphosed rock, changed by the intense heat and pressure, and outside that the remains of the altered sedimentary rock. Cornwall's geological structure shows a series of similar zones of the three types of rock formation, with many of their varieties.

## Sedimentary rocks.

Formed by sediments such as sand, mud, and gravel, washed and laid down usually by water and solidified as their weight builds up, compressing the lower layers into stone. Sedimentary rocks formed this way include shale, sandstone, mudstone and gritstone. In Cornwall they appear as the tattered skirts around large holes in the once-enveloping bedspread, the higher parts having been worn away until the underground granite peaks were laid bare. The sedimentary rocks still remaining, altered to varying degrees by the pressure and heat of earth movement and volcanic action, are locally known by the name of 'killas'. Their cleavage (the way the rock breaks) is usually in flattish planes, the extreme being the thin layers of slate like the pages of a book, separable by a knife blade, formed by pressure-alteration of shale.



*Shale hedging stone showing roughly parallel cleavage.*

## Igneous rocks.

Formed from volcanic magma as it cools. They are crystalline in character, according to the time it takes for the molten rock to cool and solidify. The slower the cooling, the larger the crystals. Most of the igneous rock in Cornwall, not having managed to penetrate the great thickness of the sedimentary rock bedspread, cooled internally, slowly forming the granite in varying crystal sizes. The silica content also varies, shown by the amount of quartz in the granite; the more, the paler the colour and the more acidic the rock; the less, the darker and more basic the rock. This has some bearing on the soil and the flora of the locality, and hence of the hedges. Granite has a cleavage rather like cake, making it suitable for work requiring a chunky shape of stone.

## Metamorphic rocks.

These are the rocks altered by the stresses of movement and volcanic action, especially around the central once-molten intrusions where the heat was greatest. Most are extremely hard - literally baked hard - and they contain many manifestations of the turmoil, such as crystals, ores and fantastically veined, layered or crushed and reconstituted rocks. With the heating and its chemical changes added to the effects of movement and pressure, a wide variety of stone is produced. Cleavage varies from the flat easily-separated layers of the altered sedimentary rocks to the obdurate iron-hard lumps of greenstone, locally known as 'blue elvan', which, when it does break, randomly shatters, or just reduces to powder at the point of impact.



*Close-up of this gatepost granite shows it has cooled slowly, giving a fairly large crystal size and coarse texture.*

Because of the deep, accelerated erosion naturally occurring in a tumbled land-form exposed through much of its history to maritime climate, much of Cornwall's rock is very near the surface, if not actually outcropping, and the surface is scattered with weathering stones in

process of breaking down. What nature had done in exposing the skeleton, man continued; digging out the surface stones to make his fields, quarrying the granite, shale and slate to build his houses, and mining out the hard metamorphic rock to extract the minerals and metalliferous ores contained within it. Most of the highly-altered metamorphic rock found in portable pieces on the surface, apart from the pebbles on beaches, has been brought up from below in the form of mining spoil. All over Cornwall and around its coast the exposed, weathered or broken stone at the surface shows the type or types of rock below. In its abundance, the stone was used for almost everything; notably for building hedges.

## HEDGING STONE

Far more stone went into building the hedges to enclose the fields of a smallholding or farm than into the walls of the cottage or buildings. Even the garden hedge takes as much as the house; the stone from a small cottage would build less than 100 metres of hedge. In granite country, while better stone for the house might be quarried at a little distance, the hedges were built of the naturally-occurring broken and weathered lumps of stone known as 'moor-stone' found on the surface and in the soil while clearing the land for farming. In the years of mining activity hedges were built, as were the miners' cottages, from the stone spoil brought up from the nearby mine. In more eastern parts of Cornwall where neither mines nor surface stone might be in evidence, stone from the nearest quarry was used, or else turf hedges were built, their core of 'rab' showing the local subsoil content of clay and broken 'killas'.



*This view shows how the weathered moor-stone scattered on the hilltop was first cleared to build hedges round Bronze Age fields (middle distance right), with later clearance forming the larger field in foreground.*

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The hedges, therefore, even more than the houses, tell what stone lies beneath them. Seldom would anyone go to the trouble and expense of carting heavy stone any distance to build hedges.



*Inch-rule laid on top of this stone hedge in West Cornwall shows how small are the fragments of moor-stone, cleared from the fields, that were used to fill it.*

Only in today's cock-eyed economy is this done, incidentally marring the locally distinctive landscape and violating the unique geological map formed by Cornwall's older hedges, which echo on the surface of the land the formation below. The nature of the stone in the hedges can change even between one field and the next, for instance in the crystal size of the granite due to uneven cooling, or where a different mineral has invaded a fissure, or movement created a crush zone or an altered pressure in the rock. A sudden change in hedge-stone can also happen where hedges of the mining era built with waste rock from



*Broken quartz (centre) from mine spoil used in hedging - of no value to the mineral-collector.*

underground meet earlier enclosures that were hedged with surface moor-stone.

Among the many sad and disastrous results of using the flail-mower to trim Cornish hedges is that the heavy mat of ivy and coarse vegetation it induces not only destroys the biological diversity of the hedge, but conceals its geological diversity. Before the introduction of the flail much more of the stone was visible in most Cornish hedges, especially in winter, plainly revealing its pattern of building, and showing in the weathered surfaces of the stone a fascinating mixture of forms and colours.

Only one part of Cornwall's geological treasury of rocks fails to appear in the hedges - any ores or collectable crystals or other minerals; so there is no point looking for them or vandalising hedges in hope of 'specimens'. The most to be seen is occasionally some inferior formation, or incidental coloured staining in the rock from its one-time proximity to minerals. Any quartz used as hedging stone is in its 'massive' form (close-grained, without characteristic crystals) and is of no value. Every stone used in hedging passed the eagle eye of miner, quarryman and hedger, all of whom sharply removed anything that could either be processed or sold to the insatiable collectors' market of the 18th and 19th centuries which coincided with the industrial mining era.

The three main types of stone in Cornwall's hedges, and their areas of distribution, are the moor-stone of the granite uplands, the highly metamorphosed rock of the mining areas, and the altered sedimentary shales and slates of the outer zone, mainly in North and East Cornwall. Along the southerly coast appear some differences, including most of the Lizard peninsula, where granite-gneiss, gabbro, serpentine and hornblende-schist, among others, make a fascinating geological jigsaw puzzle.

### Moor-stone.

The naturally-occurring granite moor-stone produces the widest variation of hedge-building styles within the one type of stone. This is because the stone is used as found, varying



*Typical Cornish hedge in granite country built of weathered lumps of moor-stone.*

from the small stones easily raked out of the soil, to weathered boulders lying half-submerged at the surface. Consequently the hedges vary, too, from the stone hedge neatly built of cobble-sized stones and filled with a rubble of small stone fragments, to the row of large natural boulders set on end in the ground, tombstone-style. Between these extremes are patterns of building adapted to all sizes of moor-stone pieces; most commonly, the classic Cornish hedge with sorted stone, using the larger lumps for grounders along the bottom and with courses diminishing in size to the top.

Moor-stone 'rises' perpetually towards the surface, and on farmland traditionally the pieces were removed by hand about once in every generation, clearing the soil to a depth of about 9 inches (23cm). On two farms, one in Pembrokeshire and one in Cornwall, the farmers each described to the author's husband, independently, large coffin-sized granite boulders as having risen during their long lifetimes by an average of about a quarter of an inch (6 mm) a year.



*Granite hedge using the big moor-stone boulders unbroken, as cleared from the field.*

During the heyday of the 18th and 19th century mining boom, many smallholdings were enclosed from the common land around the villages. Much of this high land was so stony it had never been cultivated, some of the boulders being as big as elephants. With the skills developed through mining, these huge rocks could now be dynamited to clear the land further on to the hilltops than ever before. The method was adopted by farmers to get hedging stone, using a small charge of explosive to break any boulder in their croft pasture that was too big to use. The skill lay in placing the charge and using just enough to jar the boulder into separating naturally in its roughly cubic chunks; too much, and it would shatter into more angular, awkward shapes. The resulting stone is recognisable by the sharper cleavages and less weathered exterior than natural unbroken moor-stone. Often the pieces of dynamited clearance stone show part of the weathered outer face of the original boulder, distinguishing it from quarry waste which, along with over-burden, was also used to build hedges.

### Mine spoil.

Metamorphic rock extracted during mining operations required great skill in building. Detached from the bedrock by blasting, then broken into smaller pieces by sledge-hammer, it emerged in chunks varying in size from a couple of inches to a couple of feet across. It varied in composition through a spectrum of rock and mineral types including such idiosyncratic forms as greenstone and quartz, was usually extremely hard, and was broken into jagged, difficult shapes.



*Cornish hedge near Camborne built of mine spoil showing variations in type and colour of stone, with red mineral staining.*

Much of it might truly be called a hedger's nightmare, yet many beautiful hedges and mortared walls were built with it in the mining districts. On a wet day the subtle colours of the variegated stone show their beauty, from the glittering white and cream quartz and feldspar through many shades of pink, brown, ochre, green and grey, to black. Often the colours are mingled as the rock is layered, mottled or veined.

Characteristic of a mine-spoil hedge is the usually wide variety of stone, every piece differing somewhat from its

neighbour in colour and composition, or, frequently, rubbing shoulders with a completely different rock type. Hedges built from mine rock follow the classic Cornish hedge pattern, though, as many cottagers built their own boundaries, the skill varies. Some of those in the poor mining 'badlands' are now little more than a low mound of rocks and earth topped with makeshift fences. Others, in which the odd shapes were used with interlocking skill, are as sound and good as any in the county, and being so hard, the stone itself does not deteriorate.

Shale and slate.

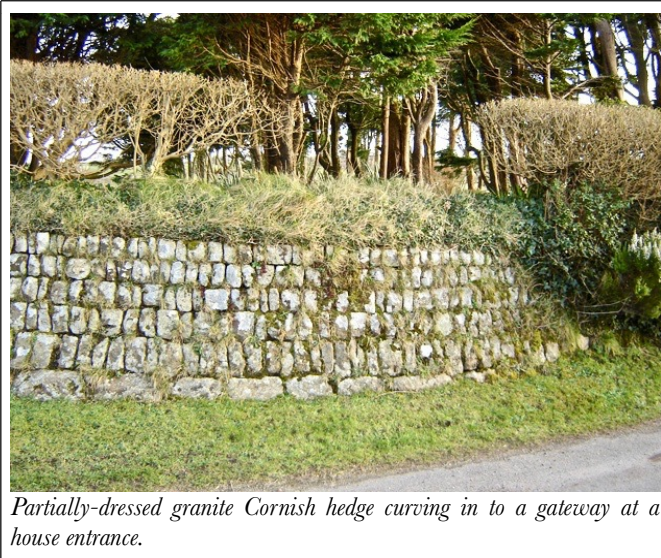
The parallel cleavage planes of these give flat pieces, often quite thin, which demand a radically different pattern of Cornish hedging. Easier to handle than the chunky lumps of granite or metamorphic rock, they yet require skill because they are so thin. They are sometimes soft, breaking easily under the weight of those above, and often slithery, so the hedge sides more easily develop a bulge; a badly-built slate hedge soon falls down. To counteract these tendencies, different ways of building with shale and slate evolved, notably the herringbone pattern, a favourite with affectionate local names: 'Jack and Jill', 'Darby and Joan' or 'Kersey (or Kensey) way'.



*Hedge in North Cornwall built of slate in traditional 'Jack and Jill' (herringbone) pattern.*

Using natural moor-stone pieces variously-shaped by weathering, or mine-rock jaggedly blasted and too hard to break easily by hand, or small naturally-outcropping slate debris, hedgers developed the skill and style in building Cornish hedges that scorned the use of a hammer to trim and lay the stone. Only at house entrances or in competition hedging were 'show-pieces' built, sometimes dressing (trimming to shape) the stone, a hard-rock skill quite unlike dry-stone walling which evolved from a very different geological legacy. It is to be hoped dry-stone walling techniques will not invade Cornwall by way of 'hobbyists' misguidedly trying to impose them on

an incompatible discipline. The unique craft of sorting and using the natural stone pieces without breaking or shaping them is inextricably linked with the traditional appearance and diversity of the native Cornish hedge. Vitally, it safeguards the hedger's wrist from unacceptable jarring on Cornwall's exceedingly hard stone.



*Partially-dressed granite Cornish hedge curving in to a gateway at a house entrance.*

Vital, too, is the link between the geology of a Cornish hedge and its flora and fauna. It is the use of naturally weathered or randomly blast-broken shapes of local stone, combined with the

appropriate subsoil as filling, that provides the variable crevice and rock-surface habitat that is invaluable to wildlife, inviting widely diverse natural colonisation by both flora and fauna.

## LOCAL GEOLOGICAL DIVERSITY

Among the distresses of our time is the progressive loss of natural diversities and local variations. The loss of geological diversity and variation is recognised as one of these sad changes. In our often false economy, in which the immediate cash expenditure is the only cost considered, materials are transported over distances rather than obtained from smaller local sources. In the latter half of the 20th century hundreds of stone-built hedges around gardens were replaced by concrete block or wooden fences, while new Cornish hedges were, and still are, built with stone carried from the few remaining large quarries, often of a different type from the natural stone of the area. Nonsensically, more often than not an old hedge with its local stone and biodiversity is actually cleared away from the same site before the new one is built using inappropriate stone from another part of the county, or even imported from abroad. This is probably due to the perceived expediency of starting afresh with clean stone, the lack of hedging skill among contract workers, shale being an easier stone to build, and the poor council specification for building roadside hedges.



*Many shale hedges are now built without regard to local geology, as in the case of this roadside hedge built around 1990 in the granite country of West Penwith. They are often built to a poor standard, and although this hedge is better-constructed than many, it still looks completely out of place in the locality. For this set-back hedge giving visibility on a bad bend, the existing hedge of local stone was bulldozed and carted away, while the inappropriate shale was brought in, instead of simply moving the original hedge a matter of a few yards and rebuilding it.*

Many field and roadside hedges have been demolished and disposed of, costing yet more transport and with the often permanent loss of valuable local stone. It was taken elsewhere for other uses, its identity of place lost; wasted in inferior uses such as hardcore or landfill; dumped over cliffs or down mine-shafts. Sometimes, with the convenience of the JCB digger, the stones were simply buried in a trench alongside the line of the hedge. This at least gives the possibility of retrieval without loss of local identity, and with revival of some of the natural flora, as long as the disinterred stone is used to build hedges nearby. So does the thrifty habit of many farmers of stockpiling their ex-hedge stone on the farm for repair of the rest of their hedges.

In the ecological and tourist interests of conserving the much-shrunken heathland, the once super-abundant source of 'clearance' stone lying about for the picking up is a thing of the past. Mine spoil, too, has dried up at source with the closure of the last mine and the deplorable tidying-up and 'landscaping' of the mining areas. If so much good, locally-available hedging stone had not been thoughtlessly bulldozed, buried and built-over in recent years, new Cornish hedges along roads and around new houses and commercial sites would not be introducing the shale hedge into the wrong parts of Cornwall.



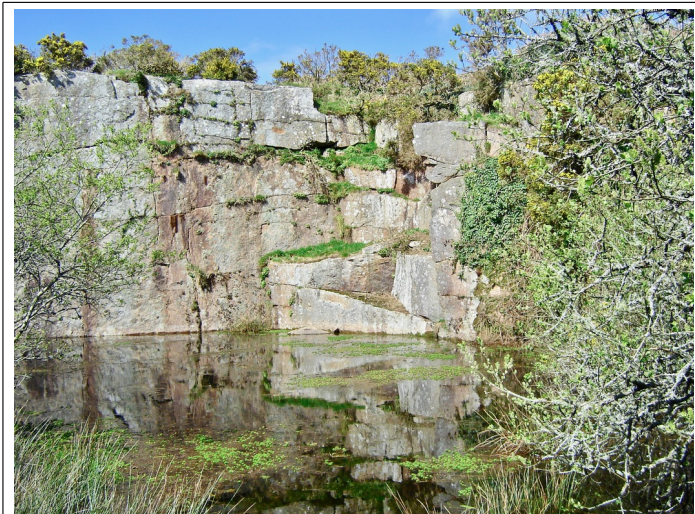
*Old rab pits make attractive minor features in the landscape and provide wildlife opportunities.*

In a future more aware of the value of heritage and of the natural local materials, re-use of local stone must be as much a priority as retaining original hedges where they stand. Where development plans require unavoidable removal of a hedge, a condition of permission for removal must be for rebuilding it elsewhere on the site, using its original materials of stone, earth and vegetation. Locally-stockpiled or buried hedge stone must be recovered for re-use, rather than importing alien stone from another part of the county. Refugee stockpiles or dumps clearly out of their ancestral

location might be geologically identified and repatriated. Much might be found by exploration along the line of removed hedges, whose position can be seen by changes on the maps if not by looking at the pattern of hedges remaining in the landscape. Local memory can be of use here, as this method of burying a hedge is mainly recent, within the era of the mechanical digger.

Old rab pits, where “rab” (subsoil) and a certain amount of moor-stone were dug out for building hedges, might be cleared of the rubbish usually dumped in them and re-worked within limits. Equally, such small pits for building an individual hedge or two might be newly dug. Lastly, moor-stone still rises to the surface in many cultivated Cornish fields and should be added to the farm's stockpile as a precious commodity.

The continuance of local character in Cornwall's hedges and landscape must depend largely on an enlightened approach to retention of existing hedges and replacement of many that have been needlessly removed. Crucial to this is recovery and re-use of local hedging stone, and ultimately there should be a new policy of opening small local quarries. Strictly limited in their dimensions and operating machinery, these, when subsequently abandoned, form an attractive feature, characteristic of the traditional Cornish landscape, and are, like the hedges built from them, a wonderful haven for wildlife.



*Small quarries, once abandoned, form a beautiful feature in the traditional Cornish landscape and are a rich haven for wildlife.*

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<p>Advice for Working on Roadside Hedges          Building Hedges in Cornwall          Building and Repairing Cornish Stone Stiles          Butterflies, Moths and Other Insects in Cornish Hedges          Check-list for Inspecting New or Restored Hedges in Cornwall          Check-list of Types of Cornish Hedge Flora          Code of Good Practice for Cornish Hedges          Comments on the © Defra <i>Hedgerow Survey Handbook</i> (1st Edition)          Comments on the © Defra <i>Hedgerow Survey Handbook</i> (2nd Edition)          Cornish Hedges and the Climate Crisis          Cornish Hedges in Gardens          Cornish Hedges on Development and Housing Sites          Gates and Gateways in Cornish hedges          Geology and Hedges in Cornwall          Glossary of some Cornish Words used in the Countryside          Hedges in the Cornish Landscape          How to Look After a Cornish Hedge          How Old is That Cornish Hedge?          Literature Sources</p>	<p>Mediaeval Hedges in Cornwall (450AD - 1550)          Modern Hedges in Cornwall (1840 - present day)          Mosses, Lichens, Fungi and Ferns in Cornish Hedges          Pipe-laying and Other Cross-country Works Involving Hedges          Post-Mediaeval Hedges in Cornwall (1550 - 1840)          Prehistoric Hedges in Cornwall (5,000BC - 450AD)          Repairing Cornish Hedges and Stone Hedges          Repairing Turf Hedges          Restoring Biodiversity in Cornish Hedges          Risk Assessment Guidance for working on Cornish Hedges          Roadside Hedges and Verges in Cornwall          The Curse of Rabbits in Cornish Hedges          The Life and Death of a Flaileid Cornish Hedge          Trees on Hedges in Cornwall          Unusual Old Features in Cornish Hedges          Who Owns that Cornish Hedge?  <a href="#">Wildlife and the Cornish Hedge</a></p>
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