

# DARTMOOR GRANITE

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Haytor Rocks – a classic Dartmoor Granite Tor

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## CONTENTS

	PAGE
1. Brief Description	1
2. Geological Detail	2
3. Uses	3
4. Places To Visit	4
5. Photographs	5

## 1. BRIEF DESCRIPTION

Granite is a type of rock which forms the surface and underlying ground of most of the high moorland of Dartmoor. It is a hard, strong, tough, durable and long-lasting material.

Dartmoor Granite formed from a molten rock (known as magma) which was once at very high temperatures several kilometres deep in the earth in the core. As the magma rose through the earth's crust it gradually cooled and slowly solidified into the attractive coarsely-crystalline rock we see today.

This process of rock formation happened about 300 million years ago below the earth's surface. In the following few million years the rocks above the granite were eroded away exposing the granite at the earth's surface where we now see it in the characteristic 'Dartmoor tor'. A 'tor' has a range of definitions, but generally refers to a rock outcrop formed by weathering, usually found on or near the summit of a hill.

Use of the Dartmoor Granite as a building stone dates back to the Bronze Age 4000 or more years ago. Remains of old mine workings for veins of tin, copper, etc within the granite are scattered throughout the moor. The valuable china clay deposits of southern

Dartmoor result from alteration of the granite in later stages of cooling when it was initially formed.

A classic symbol of Devon, Haytor is one of the most visited locations on Dartmoor and it is probably the most easily accessible of the large Dartmoor tors. A short walk up the grassy slopes from car parks and bus stops alongside the road leads to the rocks. The panoramic views from around the rocks are well worth the walk and at the same time you can look at the 300 million years old granite. Boulders of the granite can also be seen in walls and loose blocks near to the road.

## **2. GEOLOGICAL DETAIL**

Have a closer look at the granite (see Photo DG 1). It is a rock made up of several different minerals. Most obvious are the large milky-white crystals (known as phenocrysts) of the mineral feldspar, up to about 8cm in length and rectangular in cross section. Surrounding these is a matrix of smaller crystals including some more white feldspar, quartz with a clear to grey, glassy appearance and some dark brown, nearly black, shiny mica. Some varieties of the granite do not have the phenocrysts.

The 250 sq miles area of the Dartmoor Granite is shown in bright red on the accompanying geological map and key. ([link to map](#)) The Dartmoor Granite is connected at depth with the other granite masses of Cornwall, altogether forming an enormous granite intrusion known as a batholith. Heat from this mass of molten rock, at a temperature approaching 1000° C, altered surrounding rocks for several hundred metres beyond the margin, forming a metamorphic rock known as hornfels.

Shrinkage in the cooling granite led to the formation of cracks - 'joints', as geologists call them. More joints developed and were opened by stress release as the weight of the overlying rocks was removed. These joints, further widened by weathering, are seen in the cracked and broken shapes of the tors visible today.

In the final stages of cooling, residual fluids and gases condensed and crystallised in a process known as hydrothermal (water and heat) to form the economically valuable mineralisation of tin, copper and many other spectacular minerals of the southwest England ore field. The Dartmoor mines are no longer worked but remains of old workings are seen in many places. The valuable deposits of china clay (kaolin), worked on a large scale on the southern edge of Dartmoor north of Ivybridge, were formed in the granite by similar processes, later modified by weathering and water circulation in the ground.

About 50 million years ago, in the geological period known as the Eocene, the climate of Devon was especially hot and humid. In this environment the granite of the surface of Dartmoor was intensely weathered, forming the unusual shapes of the tors seen today.

The valuable ceramic clay seams known as ball clays, found in the low-lying ground of the Bovey Basin, were formed at that time. Fossils of tropical plants are found in the clay workings around Kingsteignton.

For about the last 2 million years Britain has mostly been in the grip of 'ice-age' conditions, interspersed with shorter but generally warmer 'interglacial' periods ([link to Quaternary section](#)). Seasonal freezing and thawing of Dartmoor created the boulder fields, or clitter, surrounding the tors and the cover of gravelly, broken-up granite, known as 'head' or 'growan'. Much of the soft soil and weathered rock was stripped away

leaving the granite tors of the Dartmoor landscape standing proud above surrounding areas.

The human influence on the landscape has occurred during the more benign climate conditions - an interglacial - in the comparatively short time since the latest ice sheets retreated just over 10,000 years ago.

### **3. USES**

Dartmoor has been inhabited by humans for several thousand years. Solid evidence for early habitation in the form of granite structures such as stone burial chambers are believed to date back to the early Neolithic ranging from about 4000-2000 BC when Dartmoor's climate appears to have been milder than it is today.

Dartmoor is particularly notable for its upstanding prehistoric remains, domestic, agricultural and ritual, dating from throughout the prehistoric period. There are many examples of late Bronze Age settlements on the moor in the form of 'round houses', mostly dating back as far as 1000 BC, possibly earlier. Most of the granite was probably obtained as loose blocks from the ground surface but it would appear to have been in great demand for shelter, no doubt supplemented by wood and other vegetation for the round-house roofs, for which little evidence remains.

The ancient stone crosses and clapper bridges made of large blocks of granite appear to date from mediaeval times when travelling routes across the moor were developed for communication between the abbeys.

Granite is so tough that it was difficult to work before iron tools were available, but throughout the high moorland can be seen loose, partly shaped, stone blocks known as 'moorstone', some with clear evidence of attempts at splitting and shaping the stone by means of 'feather and tare'. This involved drilling small shallow holes in a line along a granite block and splitting it with wedges, hammer and chisel. This was the start of using the granite as a shaped building stone for widespread use, especially houses, but also everyday rural items such as gateposts, drinking troughs, headstones, etc. Granite from the Haytor quarries was used, in part, to construct the former London Bridge and much of the rest of the stone appears to have come from Dartmoor quarries near Princetown. Quarrying of Dartmoor Granite was then an important source of employment in the local economy. The Dartmoor Prison at Princetown was, of course, built with Dartmoor Granite.

Quarrying of Dartmoor Granite progressively reduced in the last century, now it is insignificant and sources of Dartmoor granite for building restoration are now scarce.

Also now closed are the metal mines of tin, copper, lead etc which were another mainstay of the Dartmoor economy in years past. Interestingly, there is now renewed interest in reopening a large scale tungsten-tin mine in the granite at Hemerdon on the south western edge of Dartmoor just outside the National Park boundary and this, if it proceeds, could bring a significant boost to the local economy and secure European supplies of this essential metal.

The china clay works in the same area continue to be important in the local economy and in markets both national and international. China clays and the related ball clays of Bovey (together the kaolin minerals) supply the paper, ceramics, plastics and numerous other industries that are now essential parts of our modern society.

## 4. PLACES TO VISIT

Please refer to the safety guidance about visiting geological sites on our website before visiting the places listed below.

### Two Bridges Quarry

Location: On Dartmoor, a small disused roadside quarry and car park north of the B3212/B3357 road at Two Bridges near Princetown.  
Ordnance Survey 1:50 000 Sheet 191, National Grid Ref: SX 609 751

Description: The small disused quarry is often visited by student parties studying the granite and its alteration to china clay by hydrothermal and weathering processes (see Photo DG 3). The car park is convenient for moorland walking alongside the West Dart River with examples of prehistoric round-house settlements built of local granite.

### Burrator Quarry

Location: 3km east of Yelverton on the south-western edge of Dartmoor  
Ordnance Survey 1:50 000 Sheets 201/202, National Grid Ref: SX 549 677

Description: This small disused quarry, with car parking, features one of the few known exposures of the contact between the Dartmoor Granite and the surrounding country rock – in this case Devonian slates altered by heat of the granite to hornfels (see Photo DG 2).

Around Burrator Reservoir, this beautiful area offers many opportunities for country walking and cycling, and of course to look at the geology and landscape and the dam constructed of concrete and granite blocks faced with dressed granite.

An informative book 'The evolution of a Dartmoor landscape – exploring Burrator' by Peter Keene, is available in full at <http://www.dartmoor-npa.gov.uk/au-burrator.pdf>

### Haytor Quarries and Granite Railway

Location: On Dartmoor alongside the B3387 Bovey to Widecombe road.  
Ordnance Survey 1:50 000 Sheet 191, National Grid Reference: SX 766 771

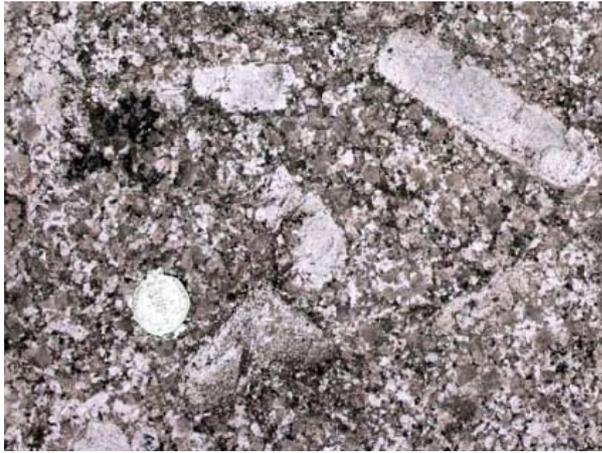
Haytor is described in the Introduction. Have a look at some of the old Haytor quarries to the north of the tor where the granite was worked for building stone. The unique Granite Tramway was used in the mid-1800's to transport the stone from the moor to Teignmouth and sent for use in London's buildings and elsewhere. See Photo DG 4 and [www.devon.gov.uk/templerwayleaflet.pdf](http://www.devon.gov.uk/templerwayleaflet.pdf).

### Widecombe-in-the-Moor

Location. A well known village in the heart of Dartmoor about 6 miles east of Bovey.  
Ordnance Survey 1:50 000 Sheet 191, National Grid Ref: SX 718 768.

Description: Widecombe has much to offer the visitor but in this context the interest is in the old buildings made of Dartmoor granite. The large and splendid granite church is known as 'The Cathedral of the Moor' (see Photo DG 5). The high ground to the west is Hameldown with a fine circular walk, following in part the Two Moors Way and passing several old stone barrows (burial mounds ) and a fine old stone wall. See Photo DG 6 and [www.widecombe-in-the-moor.com/about.php](http://www.widecombe-in-the-moor.com/about.php).

## 5. PHOTOGRAPHS



Close-up view of Dartmoor granite crystal texture. 20p coin for scale. Photo DG1. © Clive Nicholas



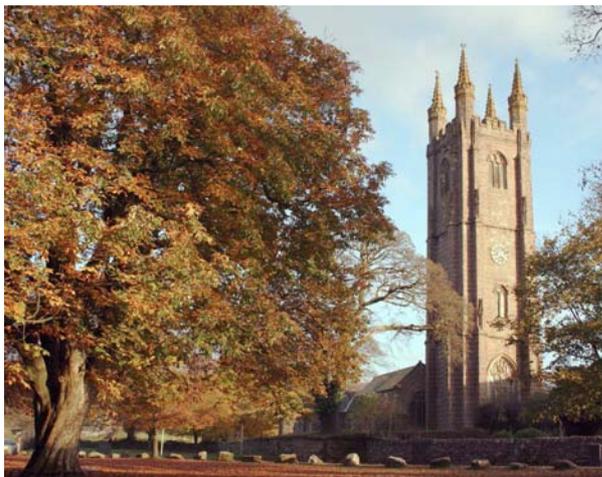
Burrator Quarry - contact of Dartmoor Granite at right side with slaty hornfels at centre/left. Photo DG2. © Willem Montagne



Explaining china clay origin and weathering in the Dartmoor Granite – at Two Bridges Quarry. Photo DG 3. © Clive Nicholas



Haytor Granite Railway, with its rails made of Dartmoor Granite. Photo DG4. © Clive Nicholas



Widcombe Church. Built with Dartmoor Granite. Photo DG5. © Clive Nicholas



A high moorland Dartmoor Granite dry-stone wall, at Hameldown, near Widcombe. Photo DG5. © Clive Nicholas