

Oxfordshire minerals

This is an article about some of the minerals found in the county of Oxfordshire.

The sedimentary rocks of Oxfordshire contain a surprisingly large number of different minerals. Some make up the rocks themselves, for example, the ironstone that underlies the Banbury area is composed partly of chamosite and goethite; it gets its green and orange-brown colours from these minerals, and many buildings in and around Banbury are constructed of this stone.

Other minerals are found in veins and nodules, and were deposited in existing rocks by water rich in dissolved chemicals. 'Septarian nodules' were formed by bacterial action at the bottom of the sea in Jurassic times. When they were buried by more sediments below the sea bed, they started to dry out, developing shrinkage cracks. Water filtering down through the rock has deposited calcite, gypsum, baryte and celestine in the cracks, sometimes as well-formed crystals. Septarian nodules are found in the Oxford Clay, a Jurassic rock which stretches across the county from west to east, underlying the Thames valley and the city of Oxford.

What is 'Learning more'?

'Learning more' presents a series of articles about the Museum and its collections. It is designed for older students, teachers, researchers, and anyone who wants to find out more about particular aspects of the Museum's work and its history.

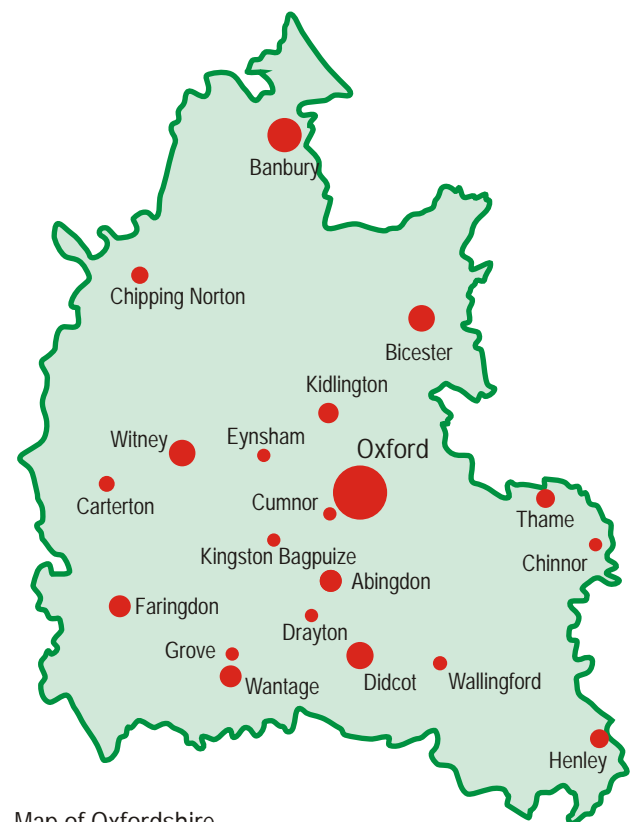
This article introduces some of the minerals found around the county of Oxfordshire. It was originally designed and illustrated by a student from Oxford Community School during a week's placement at the Museum, funded by the British Gas Lattice Foundation.

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Finding minerals in Oxfordshire

There are few natural exposures of rock on public land. Minerals are usually found in working quarries and in temporary exposures made during road building and construction work. It is essential to obtain permission from the quarry owner or manager, or the landowner, before attempting to look for minerals on private land.

Some of Oxfordshire's minerals can be seen in the Museum's display *British Minerals: a heritage revealed*.



Map of Oxfordshire

Showing major towns. Many of the localities listed in this article, like Cowley, Cumnor Hill, Headington and Yarnton are found within, or close to, Oxford city itself.

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Minerals from around Oxfordshire

Aragonite

Shelly fossils are very common in Oxfordshire rocks and are sometimes composed of aragonite.

Baryte (barium sulphate)

Small, white, crested aggregates of baryte crystals have been found in septarian nodules (hard round concretions which have shrinkage cracks lined with minerals) in the Oxford Clay at Yarnton. Similar and equally rare deposits of baryte have also been found across the county border at Calvert, Buckinghamshire.

Calcite (calcium carbonate)

Calcite is a very common Oxfordshire mineral. The limestones of Oxfordshire are composed mainly of calcite. Some are of Jurassic age, but the beds of chalk, a very pure form of limestone, are of Cretaceous age. Clay deposits in the county may contain substantial amounts of fine-grained calcite, and the shelly fossils which are abundant in most of the geological strata of Oxfordshire are often composed of calcite.



Calcite (calcium carbonate)

'Dog-tooth' crystals of calcite from Bunkers Hill quarry, Kirtlington.

Well crystallised examples of calcite, most commonly the acute rhombohedral 'dog-tooth spar' form, are found lining mollusc shells and infilling fractures and cavities in the limestones. Calcite crystals also line shrinkage cracks in septarian nodules - hard round concretions found in the Oxford Clay.

Calcite occurs as stalactitic deposits in both natural cavities and human excavations such as mine adits in limestone. Examples come from Stonesfield where the fissile limestone has long been mined for roofing 'slates'.

Celestine (strontium sulphate)

Celestine was first discovered in Oxfordshire rocks in 1979 during the construction of the Cassington Sewage Works, and has subsequently been found elsewhere in the county. It occurs as colourless to blue transparent crystalline masses in the cracks in septarian concretions, along with calcite, pyrite and rare baryte. Crystals of intermediate compositions between baryte and celestine are well documented.



Celestine (strontium sulphate)

Blue celestine with white and brown calcite, from the ARC quarry between Cassington and Yarnton.

Chamosite (iron magnesium aluminosilicate)

Chamosite is an iron-rich chlorite mineral that is found in the Lower Jurassic Marlstone ironstones of the Banbury area to the north of the county. It occurs as oolites (tiny rounded grains resembling fish eggs) cemented by siderite, and gives the stone a distinctly green colour. Much of the ironstone has subsequently been weathered to goethite.

Goethite (iron oxide hydroxide)

Goethite occurs widely as brown coatings in limestones and clays, but individual crystals are rarely seen. The pigment 'yellow ochre' is a mixture of goethite and clay minerals, and in the past it was obtained from Shotover, near Headington.

Weathering of the Marlstone ironstones found in the Banbury area converts chamosite and siderite to goethite. The resulting orange-brown building stone has been used widely in this part of the county.

Gypsum (hydrated calcium sulphate)

Gypsum is the most well-known of all the Oxfordshire minerals, and fine crystals from the old quarries of Shotover, near Headington, are held in museum collections worldwide.

Gypsum is found almost anywhere in the county where beds of clay are exposed.

Some crystals are transparent and colourless but most are clouded grey with inclusions of clay. Both single and twinned crystals are common, and rosette-shaped clusters of crystals are particularly attractive. The fibrous form of gypsum, 'satin-spar' is much rarer in Oxfordshire.



Gypsum (hydrated calcium sulphate)

A single crystal of gypsum (left) and twinned crystals (right), both from Shotover, near Headington.

Natrojarosite (hydrated sodium iron sulphate)

Natrojarosite occurs as yellow powdery masses in the Oxford Clay, usually associated with crystals of gypsum. It is derived from the weathering of pyrite. The first natrojarosite from Oxfordshire was identified using X-ray diffraction analysis on specimens collected by Museum staff in Cassington during the construction of the new sewage works in 1979. Large amounts were found in 1984 in a temporary pit in the Oxford Clay at the Army Ordnance Depot, Bicester.

Natrojarosite
(hydrated
sodium iron
sulphate)

Natrojarosite
from the Army
Ordnance
Depot at
Bicester.

**Pyrite (iron sulphide)**

Pyrite is a common mineral in the Oxfordshire clays and in other rocks of the county. It can occur as well-formed cubic or pyritohedral crystals, but is often found as thin microcrystalline coatings lining fossil shells. It may be tarnished, giving an iridescent appearance.



Pyrite (iron sulphide)

Crystals of pyrite in an ammonite, from the old Chawley brickworks, Cumnor Hill.

Quartz (silicon dioxide)

Although one of the most common of minerals worldwide, quartz crystals are rather rare in Oxfordshire, where they occasionally line small cavities in limestone. Quartz is found most extensively in the county in the form of sandstone and gravel, of which there are huge commercial deposits.



Quartz (silicon dioxide)

Crystals of quartz on calcite in limestone, collected in 1939.

Siderite (iron carbonate)

Siderite occurs with chamosite in the green oolitic Marlstone ironstone found in north Oxfordshire. Both chamosite and siderite are commonly altered by weathering processes to orange-brown goethite.

Sphalerite (zinc sulphide)

Sphalerite is very rare in Oxfordshire. Flattened brown crystals were discovered in calcareous nodules during the construction of the M40 motorway just inside the Oxfordshire border south west of Kings Sutton.



Sphalerite (zinc sulphide)
Sphalerite crystals in a calcareous concretion discovered during the construction of the M40 south west of Kings Sutton.

Vivianite (hydrated iron phosphate)

Vivianite occurs as bright blue nodules and powdery masses in clay at various locations in the county. It forms as a result of weathering of fossil bone (composed of calcium phosphate) and pyrite (iron sulphide), both of which are locally abundant in Oxfordshire clay deposits.



Vivianite (hydrated iron phosphate)
Powdery blue vivianite in Oxford Clay from Cassington.

Minerals in the Museum

The rocks and minerals displays occupy the aisle south of the central aisle of the main court. The displays on the north side of the aisle explain how minerals and rocks form. They show how the rock cycle works, and explain the powerful forces of plate tectonics.



Visitors are invited to touch the large geological specimens in the centre of the rocks and minerals aisle; they include a mass of golden pyrite from Peru, and a huge smoky quartz crystal from Russia.

On the south side of the rocks and minerals aisle the display, *Finding out about minerals* introduces the different properties of minerals and how they are used to help with identification. The *Industrial minerals* and *Ore minerals* displays show examples of economically important minerals, and all sorts of household items made from them, or metals extracted from them.

The final two cases in the aisle introduce the mineral wealth of Great Britain and Northern Ireland. *Heritage preserved* shows some of the fine and sometimes rare minerals obtained in the past from the now defunct metal mines of the United Kingdom. Quarrying for roadstone and industrial minerals remains a thriving industry, and minerals from working mines and quarries are shown in the *Heritage revealed* display.

Perhaps the most eye-catching display in the Museum is the fluorescent minerals exhibit which is housed in a hexagonal case at the eastern end of the rocks and minerals aisle. Visitors entering the darkened area are enchanted by the glowing specimens before them.