WHATLEY QUARRY CRYSTALS

Introduction and Geology

Whatley Quarry is a super quarry in east Mendip and is located on a belt of steeply dipping Carboniferous Limestone on the northern limb of a major geological feature known as the Beacon Hill Pericline (this is a type of folding where one side is more steeply dipping than the other side).

The Carboniferous rocks of the Mendip Hills are about 330 million years old and were deposited on the floor of a warm tropical sea. The limestone was originally a soft lime rich mud which has hardened over time to form limestone. Evidence of the types of marine life that contributed to the limestone are found as Crinoids (Sea lilies), mostly stem fragments known as ossicles and corals- mainly solitary types which have shapes similar to ice cream cones or narrow tubes.

Some of the limestone beds seen in the quarry are dark grey to almost black in colour. This is due to the presence of organic material derived from plants and algae. This is why one of the limestone units seen in the Quarry are described as he Black Rock Limestone. Higher limestone beds contain less organic material and are lighter grey in colour, these limestone beds are known as the Clifton Down limestone.

Similar beds are seen exposed in the Avon Gorge near Bristol. This high organic content is responsible for how some of the minerals have formed in the rock and gives rise to its distinctive smell when freshly broken.

The quarry extracts rock from almost all of the Carboniferous Limestone sequence seen in the quarry which has a steep dip at around 65 to 80 degrees to the north. The base of the quarry is below the water table so requires continuous pumping to keep it dry.

How the minerals formed

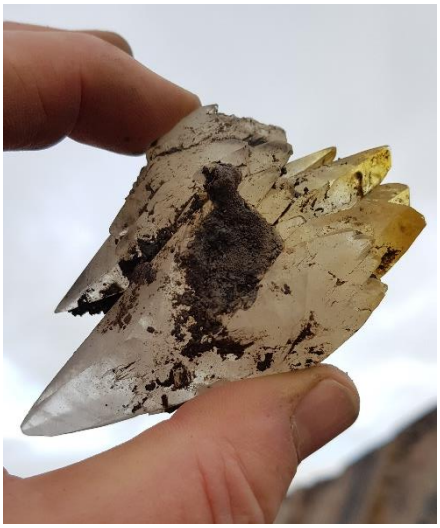
Limestone is usually a brittle rock, it is subject to fracturing, faulting and can easily be dissolved by water that is acidic as the calcium in the rock is very reactive, this is why caves are commonly found in Limestone areas. Because limestone is chemically reactive it is an ideal host rock for minerals to be deposited and Whatley quarry has yielded a wide range of minerals , the most common types are Calcite (Calcium Carbonate, Haematite (Iron Oxide) Pyrite (Iron Sulphide or fool's gold) Goethite (Iron oxide) and smaller amounts of Quartz (Silicon dioxide) and more rarely Fluorite (Calcium fluoride).

These minerals formed millions of years ago when the Carboniferous rocks of the Mendips were subject to intense folding and fracturing during a mountain building episode about 290 million years ago, this was known as the Hercynian orogeny.

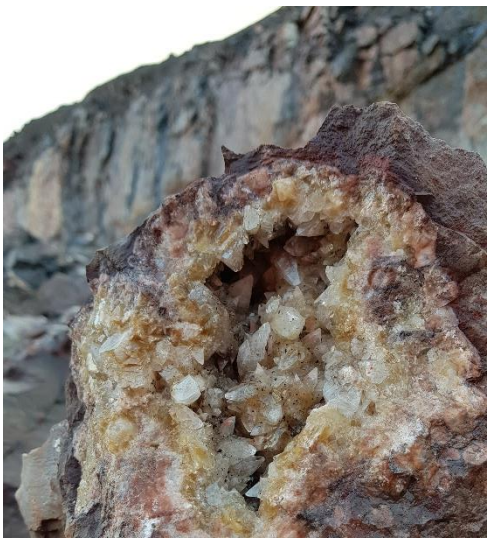
Intense pressure and deep burial of the limestone caused minerals trapped in the limestone and older rocks to dissolve and these were transported by hot fluids and salty brines (Hydrothermal brines) into the rock, widening fractures and creating cavities. These were filled by the minerals as the hydrothermal fluids cooled and minerals were deposited out of solution, this is why some of the crystals form layers and in fault lines and fractured faces. Other minerals were deposited in cavities (known as vughs), these are common throughout the quarry and these have replaced earlier minerals such as gypsum (Calcium sulphate) or that formed when the limestone beds were deposited in very shallow sea which periodically became exposed to the atmosphere, this led to waters becoming very salty and in some parts of the world, these types of deposits form flat coastal plains known as sabkhas.

Over time, the minerals in the Carboniferous rocks have been subject to chemical change and transformation, some have been remobilized via pressure solution, others have been subject to further fracturing and faulting. Other younger rocks have contributed minerals through dissolution and later earth movements about 60 million years ago. This has also resulted in later phases of mineralization.

All of these different events and minerals can be seen in the quarry and represent a long period of time in which rocks were deposited, uplifted, faulted and fractured and then eroded, there is evidence of cave formation which is sometimes filled by mud and silts which were deposited during the Triassic period of geological time about 200 million years ago.

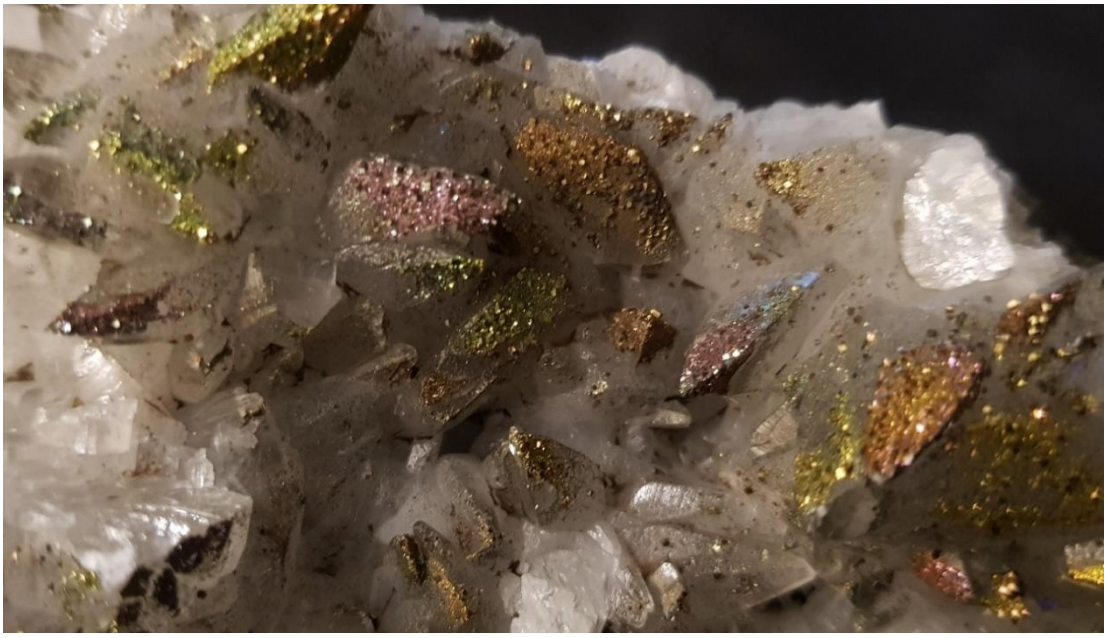


Twinned Calcite scalenohedra (dog tooth spar) about 4 cm long. The yellow/amber colour is due to the presence of Iron minerals. The purple hue is due to ultraviolet light.



Yellow fluorite on Calcite with a dusting of Goethite.

Cubic crystals of Iron Pyrite (Fools gold on calcite).



Crystals of iron pyrite on calcite (dog tooth spar), the crystals have oxidized and are iridescent – this is sometimes described as peacock stone.

A single calcite dog tooth spar as found in the quarry.

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