A visit to The Museum of Bath Stone, October 2024

By Janet Hellen

A group of WEGA members and friends spent an interesting morning at the Museum of Bath Stone at Combe Down, now run by charitable trust. We were welcomed by Professor Gavin Willmore and then given an opportunity for everyone to view the displays lining the walls of the reception area. These included quarrymen's small tools and equipment, photos of well-known local buildings built of Bath stone, people famous for their roles in creating the Bath stone history and photos of the Combe Down mine interior.

Next, followed a showing of a short video explaining the recorded history of the mined area. This started at least as early as Roman times when the earliest parts of Bath's Roman Baths were built, using local stone from open cast pits. Even after the Romans left in 410 AD, the local inhabitants continued to maintain and use the Baths until the arrival of Saxons in 577 AD. The buildings were then left to decay as Roman traditions were no longer followed. Rather than mining and dressing new stone, the Saxons used stone from the existing buildings to construct their defences. With the spread of Christianity, monastic houses also used these sources – in the 8th century Bath's St Peter's Abbey was mostly built from recycled Roman stone. It was rebuilt twice more before the 1860's, when it was constructed in its present style using local Bath stone.

The expansion and deepening of open cast mining from the 1730's, by wealthy Ralph Allen, and the use of the stone they produced to rebuild fashionable Bath in collaboration with the fashionable architect John Wood made the stone famous. Production was helped by a tramway Allen constructed to speed up the transport of the stone to the River Avon for distribution much further afield. Previously, transport had been by horse and cart over steep, rough, stoney or muddy tracks.

Combe Down mine tramway track leading from inside the mine
(photo: Museum of Bath stone)

Changes in mine management by new owners, after Ralph Allen's death in 1764, resulted in the mining rights of small plots being leased out that were then worked by quarrymen. They had to revert to transporting the stone by horse and cart after the tramway was broken up and sold for scrap by the new estate owner. Local improvements in road structure accompanied by the installation of tollgates from 1773 unfortunately increased the miners' costs. It was not until the estate was sold in 1803 that the quarry-masters were able to buy their land and start to capitalise. From 1799 until 1815, the Napoleonic wars reduced the amount of building and demand for stone also created cash flow problems for these small businesses. However, rich land owners took advantage of lower prices. From 1810 to 1853, stone was supplied for prestigious building at Longleat, Windsor Castle and the Duke of Wellington's Apsley House and many other lesser projects.

The Kennet and Avon Canal was opened in 1810, and this did provide easier transport over longer distances. However, some of the small mines were beginning to run out of good stone by this time, and new ones that were hoping to start trading were hampered by the delays in connecting to the new Somerset Coal Canal.

This was the situation William Smith found himself after he moved to Tucking Mill House in 1798, planning to open up a new quarry on some of his land at Kingham. To finance this venture, he mortgaged some of the remainder of the land to another quarry owner and

agreed to share the expense of building a joint rail line from their quarries to the Coal Canal in the nearby valley at Midford. He borrowed further from the same man as the work continued, until 1819, when he defaulted on his loans and was committed to debtor's prison in 1820.

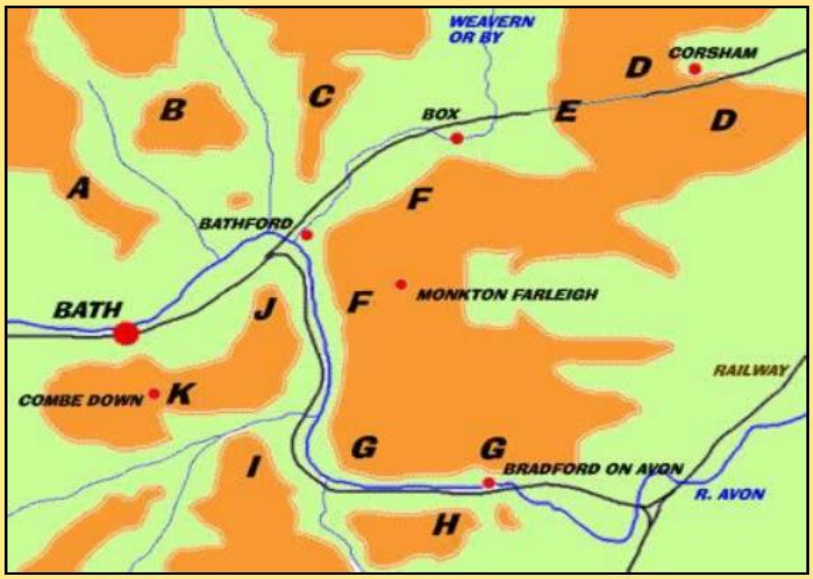
Luckily William's geological map of 1815 was selling well, in spite of plagiarism by others, and he was soon able to gain his release; although the Mill estate remained with his quarrying partner as part of the debt repayment. He moved to Yorkshire and once he had worked out the geological succession on rocks, using his field data and fossils he encountered in the Somerset Coalfield, he was able to apply this knowledge to the whole of England and Wales. This enabled him to publish a complete geological map of the whole of these countries, a tremendous achievement.

William Smith's geological map Of England and Wales. earthobservatory.nasa.gov

QUARRY LOCATIONS

A-LANSDOWN. B-CHARMYDOWN. C BANNERDOWN & COLERNE.

D-CORSHAM & AREA. E-BOX HILL.



F-KINGSDOWN & FARLEIGH. G-WINSLEY & BRADFORD ON AVON.

H-BRADFORD & WESTWOOD. I-LIMPLEY STOKE.

J-BATHAMPTON DOWN. K-CLAVERTON DOWN TO ODD DOWN.

Combe Down stone was laid down in the Jurassic Period (95 – 135 ma) when the region was under a shallow inland sea located 30 - 40˚N on Pangaea, in much warmer conditions than today, similar to present day Bahamas or Abudu Dhabi in the Persian Gulf.

Jurassic limestone outcrops intermittently in a curving range of hills in England from East Yorkshire to the Portland Bill in Devon. The coincidence of the rock's shallowly dipping beds intersecting with steep erosion slopes created by the River Avon and its tributaries at Bath enabled the extraction of the highly desired stone from at least Roman times.

Combe Down stone is classified within the Great Oolite Group, in the Chalfield Oolite Formation, below the Twerton Beds. Bath stone is extracted from the beds above the Twerton Formation.

UK Map showing distribution of Jurassic rock

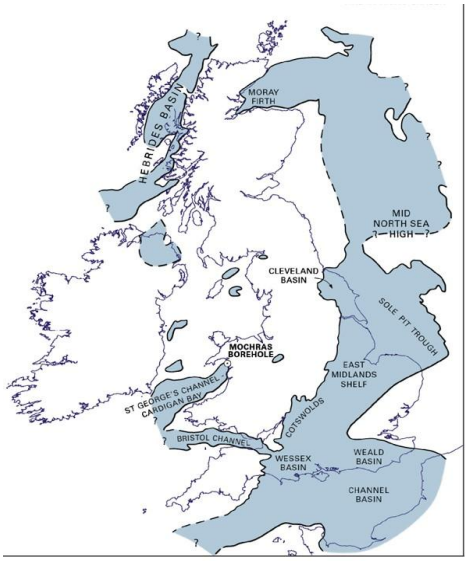


Figure 1 Distribution of Jurassic strata in Great Britain, Northern Ireland and the adjacent continental shelf.

Major depositional areas shown.

Distribution of Middle Jurassic strata in southern UK.

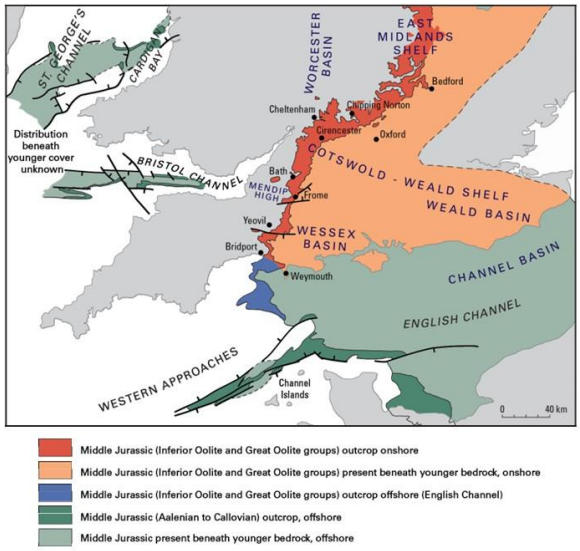


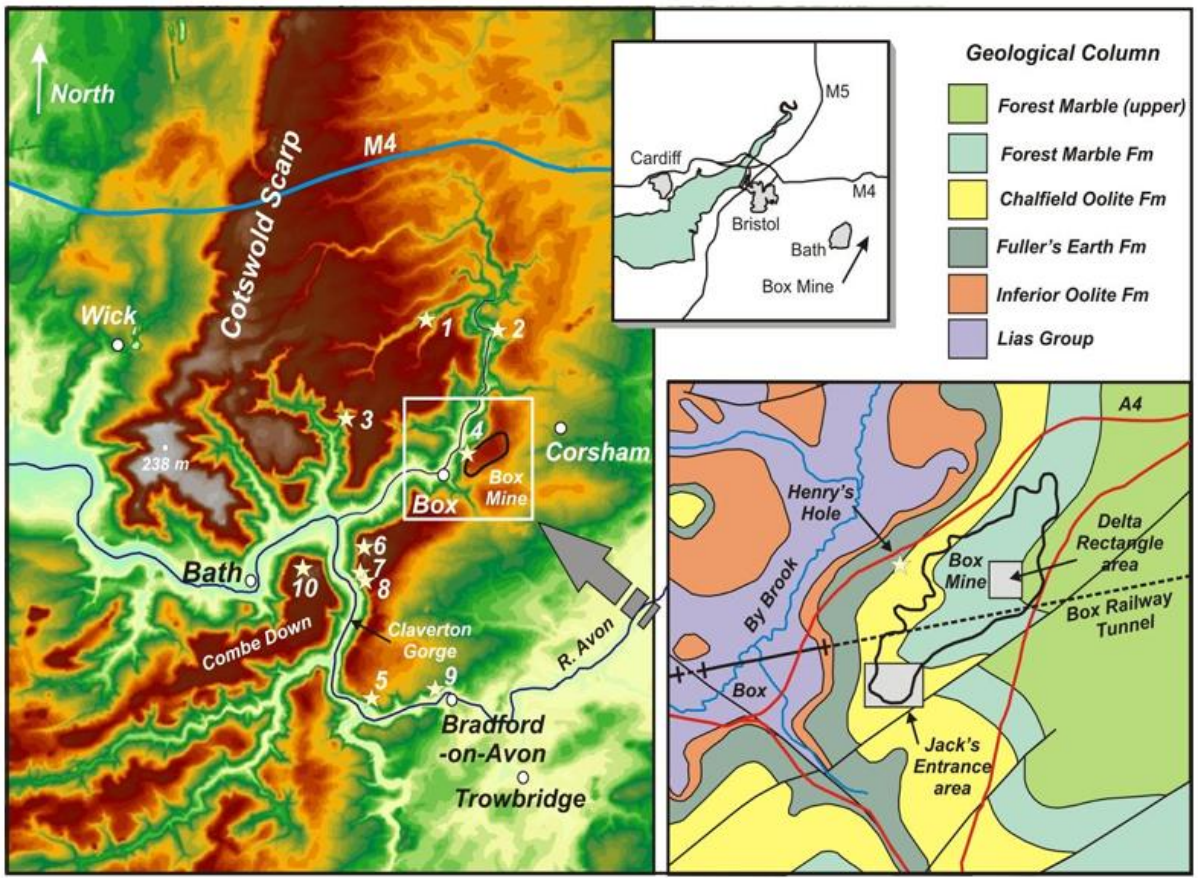
Figure 4 Distribution of Middle Jurassic strata of southern Britain including adjacent offshore areas.

(Onshore and Cardigan Bay–St. George's Channel based on BGS mapping; offshore based on Hamblin et al. 1992, fig. 2, Tappin et al. 1994, fig. 2)

Middle Jurassic Stages table

EPOCH	SERIES	AGE/STAGE	AGE OF BASE OF STAGE (Ma)
Late Jurassic (part)	Upper Jurassic (part)	Oxfordian	161.2
Mid Jurassic	Middle Jurassic	Callovian	164.7
		Bathonian	167.7
		Bajocian	171.6
		Aalenian	175.6
Early Jurassic (part)	Lower Jurassic (part)	Toarcian	183

Maps of the Rivers Avon and By Brook valleys area SE of Bath. The Chalfield Oolite Formation, containing the Combe Down Oolite, Twinhoe Oolite and Bath Oolite, is indicated.



Combe Down stone is a 168 -166 Ma Jurassic oolitic limestone, meaning it is composed of round, fish egg-like, sand-size 0.25 – 2 mm grains of calcium carbonate that were precipitated from the surrounding shallow seawater around minute algal, or possibly coral, bivalve or brachiopod skeletal fragments. Under compression, the ooids were cemented in a matrix of calcite and the pale honey-coloured rock we know as Bath Stone gradually formed.

Twinhoe Beds upon Combe Down Oolite at Avoncliff, Bath. BGS Bristol and Gloucestershire 3rd Edition, GW Green

The seawater was warm and less than 2 metres deep, with moderate to high energy, that meant the forming grains were kept shifting, creating dunes, sand waves or ripples. The changes in current direction ensured the ooids maintained a spheroidal shape until they were deposited in cross-bedded or laminated layers.

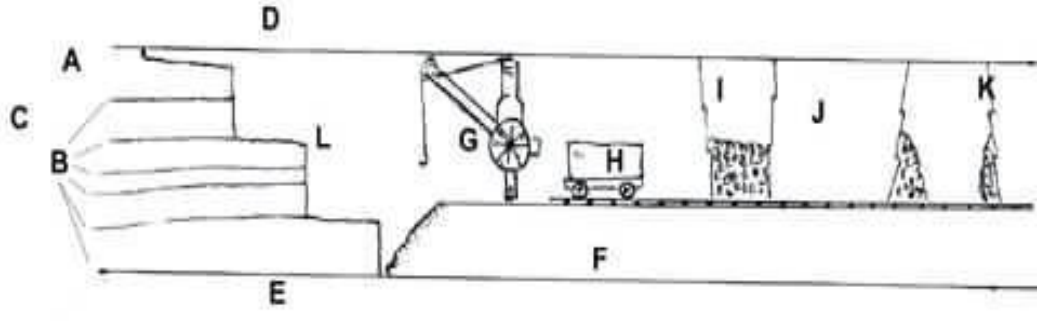
Magnified Coombe Down oolitic limestone sample
Photo: Museum of Bath Stone

Under a microscope, each grain usually has concentric layers of carbonate and are cemented to other grains by calcite. Ooids can vary from 0.25 to 2mm in diameter. Larger than 2mm ooid structures are termed pisolites

Different sized ooids plus very small proportions of minerals such as iron in the matrix cause colour variations in the same stone from different locations. The absence of cleavage, calcite veins or fossils in the Chalfield Oolite Formation made some parts more desirable for building. These were near the top of the Combe Down Member and the lowest section of the Bath Oolite Member and are termed 'freestones'. Other oolitic limestones with compositional differences that create a variation in texture must be laid in the same orientation as the source rock, to withstand weathering best.

The rock's texture allows it to act as an aquifer, receiving water draining from overlying strata and retaining it above the underlying relatively impervious Fullers Earth clay at its base. Both the Combe Down and Bath Oolite members therefore contain water, known as rock sap, trapped within the matrix when in situ in the mine. In the relatively soft rock, it provides lubrication during underground outcrops are mined by sawing large blocks from under an unwanted capping layer of hardground. Extremely long rock saws, operated by individual miners in the past, but by mechanised equipment more recently.

The mine working sequence is illustrated in a graffiti wall drawing



Mine working sequence D Hawkins, wwwchoghole.co.uk

The wet rock is easy to cut, so this is done on site in the quarry to sizes to order. Once extracted, sawn into blocks and transported to storage in air, the rock sap drains out and the outer surface of each block forms a weather-resistant skin. The rock is then ready for use in construction.

Tools used from the mid-1800s to extract stone and check safety of the workings
Photo: D Hawkins, www.choghole.co.uk

The museum was initially set up as the Ralph Allen Cornerstone in 2014 and subsequently renamed as the Museum of Bath Stone to tell the history of the area. It arose as a consequence of the Combe Down Stone Mines Project to stabilise and close off the local underground mine workings following an accidental break through from the surface in the 1980's by a contractor, followed by gale damage in 1987 that uprooted trees and exposed a hole into an underlying mine tunnel. Once it was realised that a honeycomb of shallow mine workings underlay Combe Down, properties had difficulty obtaining insurance or mortgages and so became unsaleable.

Initially Bath City Council arranged for an investigation and mapping of the mines, because of repeated accidental collapses into the mines by utilities and increased heavy traffic over the area. It took a considerable length of time to do. Firstly, the condition of 3737 of the mine's stone pillars supporting the mine tunnel and cave rooves were examined. They found 85% of underlying stone had been removed in places, as a result of the mining practice of removing the required stone and leaving only pillars of the natural limestone as support to a roof 2m thick. Since 20% of the pillars were unstable at that time, and because of the potential for a domino-effect collapse by any of the remainder, there was the possibility for sudden extensive catastrophic damage to life and property in the overlying area.

Bath and Northeast Somerset took over the project and applied for funding in 1999, with approval granted in 2000. Investigations and feasibility studies, overseen by Oxford Archaeology, aided in an initial 8-week programme of recording by 20 skilled Welsh miners. A decision was reached to stabilise the workings by shuttering and infilling with foamed concrete, with the help of up to 150 newly redundant Welsh miners. The subsequent 8 years of the project, involved video photography and laser scanning recording as well as infilling with 30,000 cu m stone plus 590,894 cu m. foamed concrete. It took until 2009 to complete stabilisation of the mine tunnels and make 649 properties of Combe Down village safe.

Combe Down mine was closed to the public, leaving heavy machinery and large tools where they were abandoned. It was found to be home to 15 different bat species. On grounds of public safety, and also bat conservation, there is now only access for the bats' census and health checks.

This has left only the ghosts of past workers, traceable through the graffiti on the walls.

An example of mine wall grafitti
(photo: Huw Jones, Brynmawr Caving Club)

A condition of the funding for the Combe Down visitor's centre required that it should be established to protect and showcase artefacts, educate the public on the history and significance of Combe Down Stone, as well as for the use of the local community. It was opened in 2014 and is run by a charity, The Combe Down Stone Legacy Trust at the Museum of Bath Stone, 54A Combe Road, Combe Down, Bath, BA2 5HZ.

This little Museum is well worth a visit and the website link is here - Bath Stone: A World Heritage Stone | Museum of Bath Stone.