A Tale of Tectonics!

Alum Bay on the Isle of Wight is one of the best (indeed one of the few) locations in the UK to get a really good look at folding and faulting; the result of tectonic processes that have taken place over millions of years of the Earth's history.

You can stand on the beach, look at the cliffs and quite literally get a glimpse back into the geological history of the Earth!

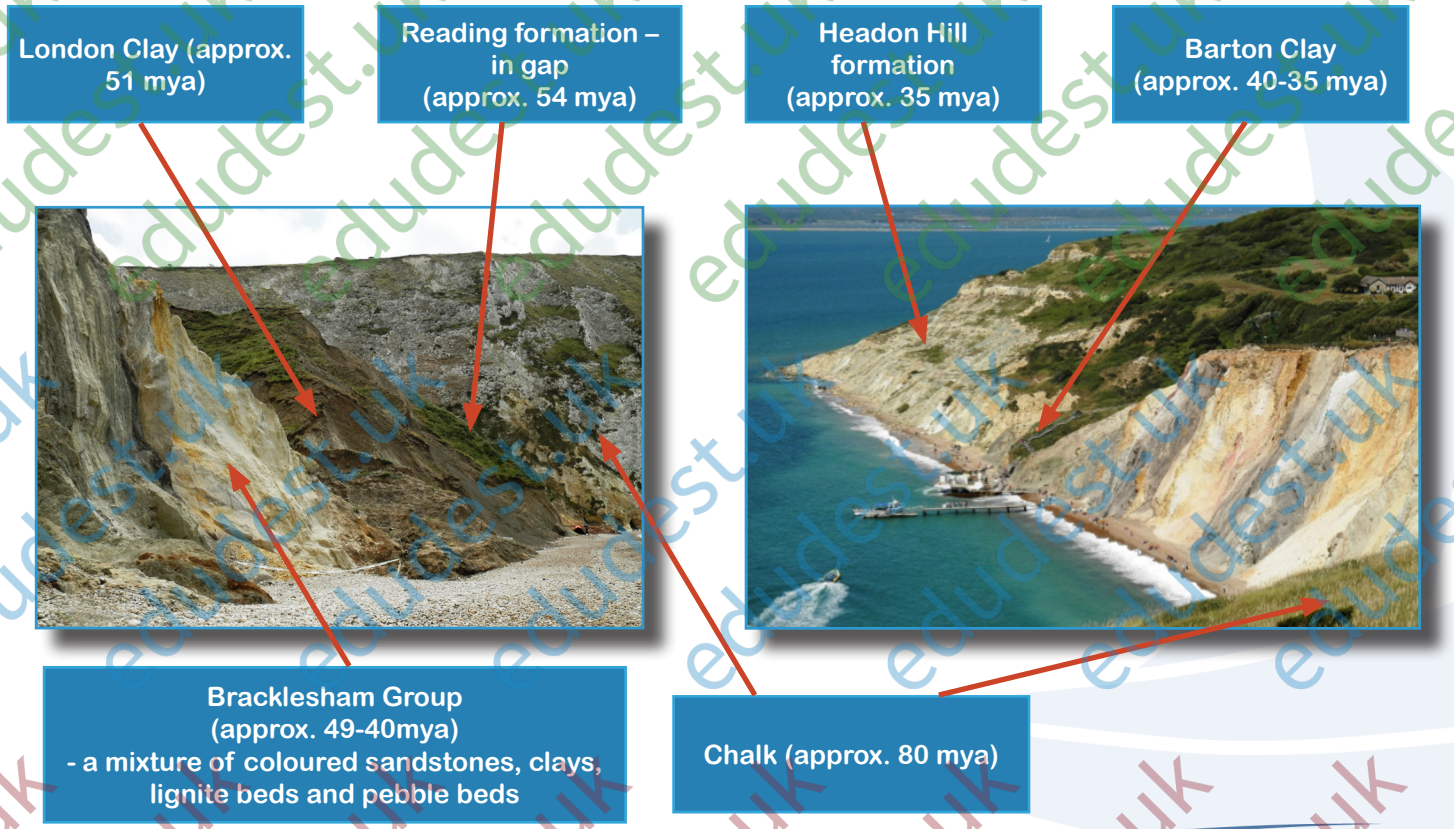
You will study:

- ✓ The geology of Alum Bay
- ✓ The tectonic and climatic processes that have led to the structure/planform of this stretch of coastline
- ✓ The evidence for processes of erosion and mass movement taking place today, including erosional landforms (The Needles).

Alum Bay Geology

The Isle of Wight is composed of **sedimentary** rocks, formed when remains of animals (e.g. bone and shells), and eroded sediments carried to the sea by rivers, accumulated on the sea bed. This sediment built up in layers, and over millions of years was compressed and cemented together to form rock. At Alum Bay, the northern and middle sections are composed of sediments deposited in a warm, shallow sea between 35-54 mya (Palaeogene Period / Eocene Epoch). Where the bay will see towering chalk cliffs, deposited in deeper water around 80 mya (the Cretaceous Period).

The images below show the main types of geology that can be found here:



A Kaleidoscope of Colour!

Question: How many different colours can you see in the Bracklesham cliffs?

Can you explain why this range of colours exists?

The situation is complex, but most experts agree that the range of colours are due to oxidation of pyrite, either in the past or more recently, has resulted in the red and brown colours of iron oxides or hydroxides.

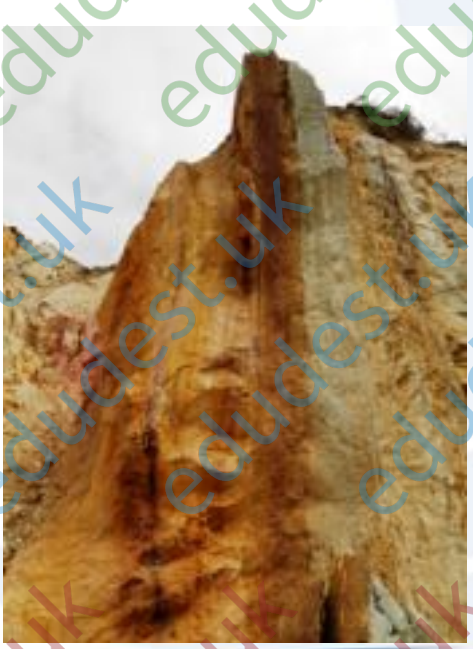
Ferrous sulphate also produces green-coloured melanterite and the yellow-coloured jarosite. There are bands of brown-black lignite and grey clays.

Coastal Structure & Planform

Looking at the image, what do you notice about the structure of the geology in this part of the coast? Look closely at…

1. The structure of the different geologies (relative to one another)

2. The structure of the strata/beds (layers) within each type of rock (the image may also help)



Tectonic Influences

The tectonic plates that make up the earth's crust are being constantly moved by the powerful **convection currents** in the **mantle** beneath.

Millions of years ago the Earth's surface looked very different to what it does today. Between 65 and 2.5 million years ago, the African and Indian plates from the south, collided with the Eurasian plate from the north.

This is known as the **Alpine Orogeny**, and led to the closure of the Tethys Ocean, leaving what we now know as the Mediterranean Sea.

It is responsible for the formation of the Alps, Pyrenees and Carpathian Mountains in Europe.

Although the UK is over 1000km from the collision zone, the immense forces caused the rocks to be pushed and folded upwards and this is most visible on the south coast of Dorset, e.g. at Lulworth (pictured), and at Alum Bay of the Isle of Wight.

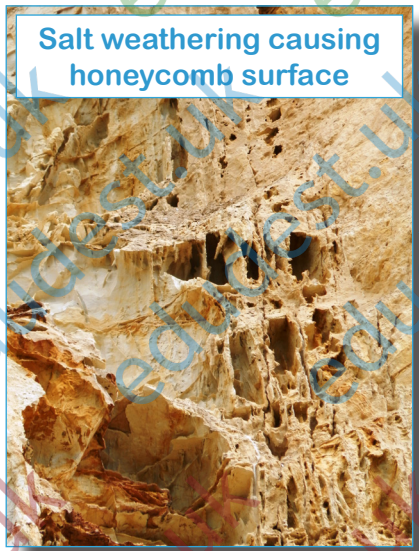
A Discordant Platform

The folding of the rocks has led to a planform where different rock types crop out at right angles, alongside each other. This type of planform at the coast is known as a **discordant** coastline and the opposite of a **concordant** coastline where rock is uniform/runs parallel to the coast. Concordant coastlines tend to produce straight(er) coastlines, whereas the contrasting resistance to erosion of the different rock types of a discordant coastline produce headlands and bays. ***What evidence can you see that this is a discordant coastline?***

Processes today…

Take a moment to listen to the waves as they crash ashore here, and you will start to appreciate the erosive power of the sea. Marine processes of erosion (***what are they?***) attack the base of the cliffs and sub-aerial weathering (***can you give examples?***) operate above the high water mark. Combined, these processes lead to a number of distinctive coastal landforms that are in evidence at Alum Bay.

Can you spot and describe/explain the following types of weathering/mass movement/ features of erosion..?



Salt weathering causing honeycomb surface

The Needles Stacks