A-level Worksheet Answers

Bracelet Bay Geotrail Answers

To use this worksheet you will need access to Google MyMaps

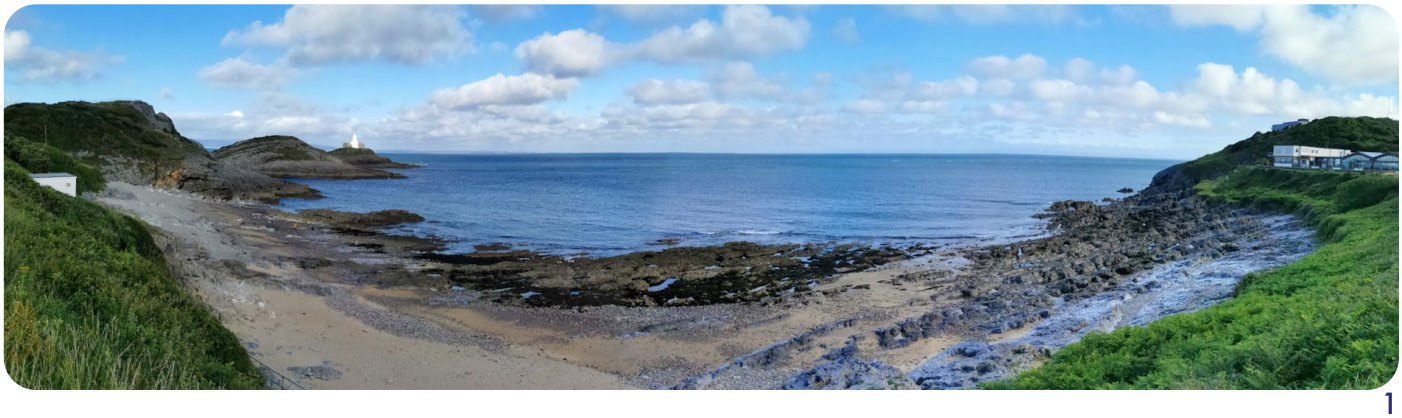
Click here to go to the Bracelet Bay Geotrail

Introduction

This geotrail was inspired by the Scratching the Surface geology and landscape walks series by Dr Geraint Owen. It covers a broad range of geological concepts including sedimentary rocks, minerals, fossils, mountain building, folding and faults. This walk also begins to introduce 3D visualisation of structures, stress fields and using sedimentary features to interpret past environments.

How to use this worksheet

The location of each stop is indicated on Google MyMaps. Each stop has an explanation with accompanying photographs showing key features of the site. This worksheet provides activities that can be done at each of the stops.



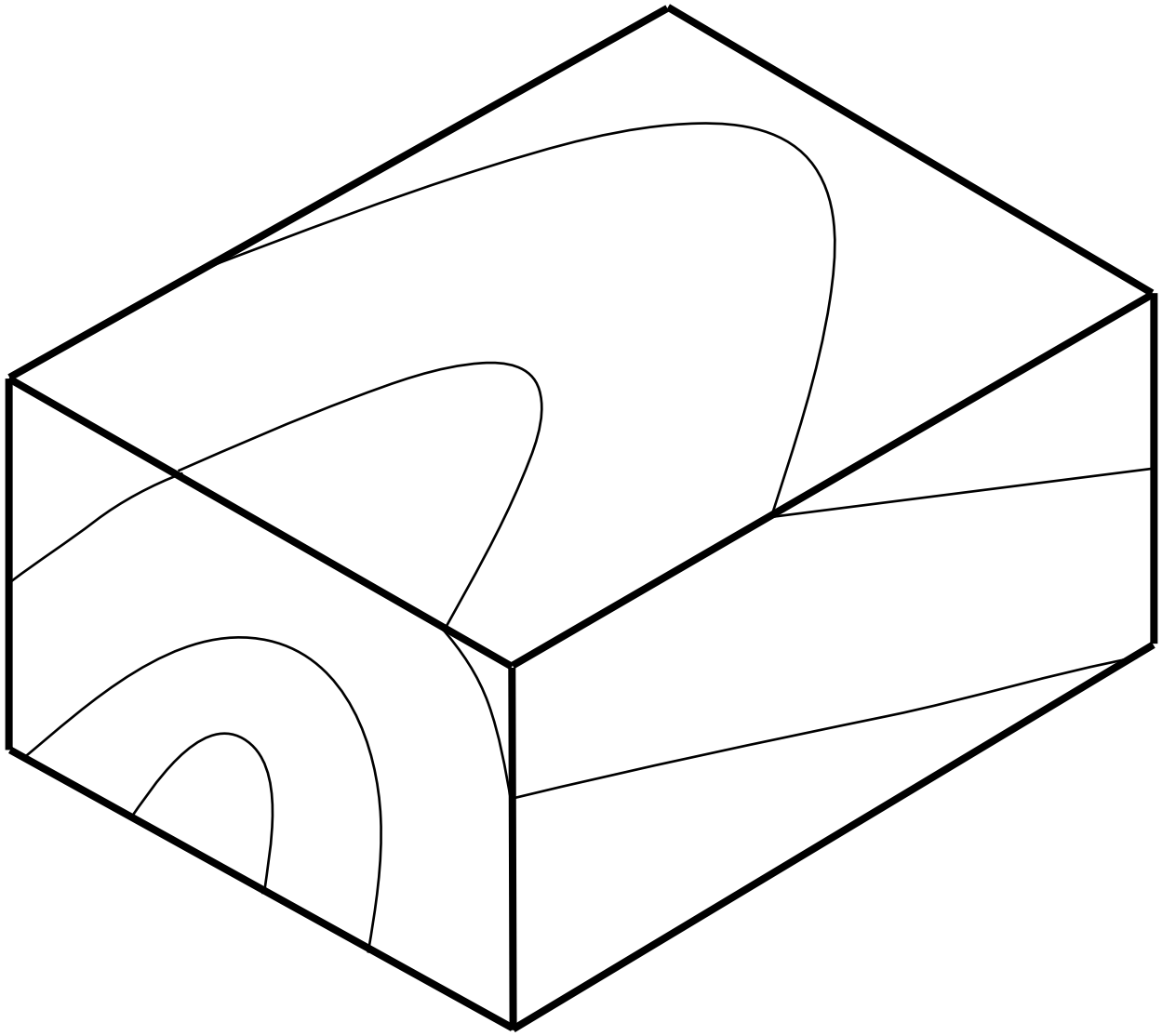
Stop 1: Plunging anticline

Activity

3D visualisation

To help visualise the anticline bend a sheet of paper or card into an arch, lean the arch forward to give the fold a ‘plunge’ and then imagine slicing a horizontal surface through it. This creates a pattern like the curving layers you see in Bracelet Bay.

Q1. Draw a plunging anticline on the block diagram below.



Stop 2: Fossil spirit level

Q1. What type of stress forms:

i) stylolites

Compressional

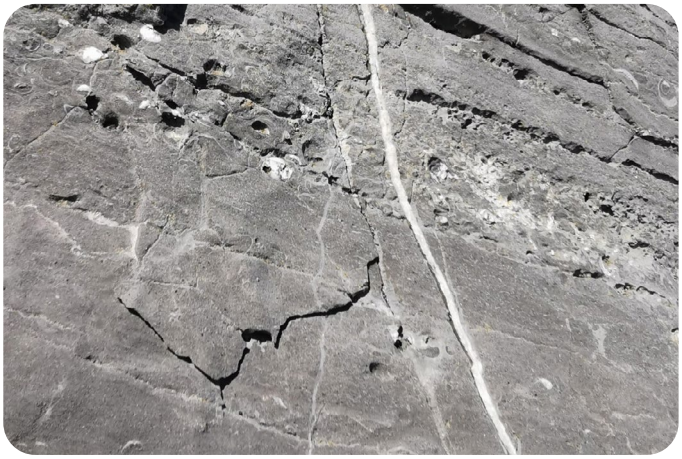
ii) veins

Extensional

Q2. Find a surface where you can see stylolites and calcite veins. Look at the relationships between them. What is the angle between the majority of the veins and the stylolite surfaces? Why might this be?

The stylolites and veins are at 90 degrees. This is probably because the minimum stress is at 90 degrees from the maximum stress and maximum stress creates stylolites and minimum stress creates veins.

Stylolite



Calcite vein

Stop 3: Fault calcite

Q1. What type of stress would have been needed for the elongate calcite crystals to grow?

Extensional- the walls were opening to make space for the crystals.

Q2.. Bearing in mind your answer to Q1, what type of fault is this likely to be?

A normal fault because these form in extensional settings.

Elongate calcite crystals

Calcite with characteristic rhombic cleavage

Field Notes and Sketches

Stop 4: Crystal formations

Q1. This site is a good place to see calcite crystal. Calcite can often be confused with quartz. List the tests you could use to differentiate between the two.

Hardness-
Calcite has a hardness of 3 and quartz has a hardness of 7. This means calcite scratches with steel and quartz does not.

Cleavage-
Calcite has 3 cleavages not at right angles and quartz has no cleavage and breaks conchoidally.

Reaction to HCl-
Calcite reacts to HCl and quartz does not.

Quartz crystal

Calcite crystal

Stop 5: Ancient fossil reef

Activity

Erratic pebbles

Spend a bit of time looking at the pebbles on the beach. Make piles of each of the different rock types you find and try to identify them.

Q1. The fossil reef contains mainly brachiopods and sponges. Is this a true representation of the biodiversity of this reef? Explain your answer.

No. The fossil record is not a true representation of the diversity of an environment because the fossil record is bias. Not every organism will become fossilised. Organisms become disarticulated upon death, rot or can be eaten by other organisms. Organisms with hard parts are much more likely to be preserved as fossils because the hard parts do not rot. There may have been many more soft bodied organisms living in this reef which were not preserved as fossils.

Brachiopod fossils

Sponge fossil

Stop 6: Oncoliths

Q1. Draw an oncolith.

Remember to add a scale and label your sketch

Stop 7: Pseudobreccia

Q1. Why are there no fossils of the organisms that made the burrows?

The burrowing organisms were likely to be soft bodied meaning when they died their bodies decayed and were not fossilised.

Pseudobreccia on Tutt head

Field Notes and Sketches

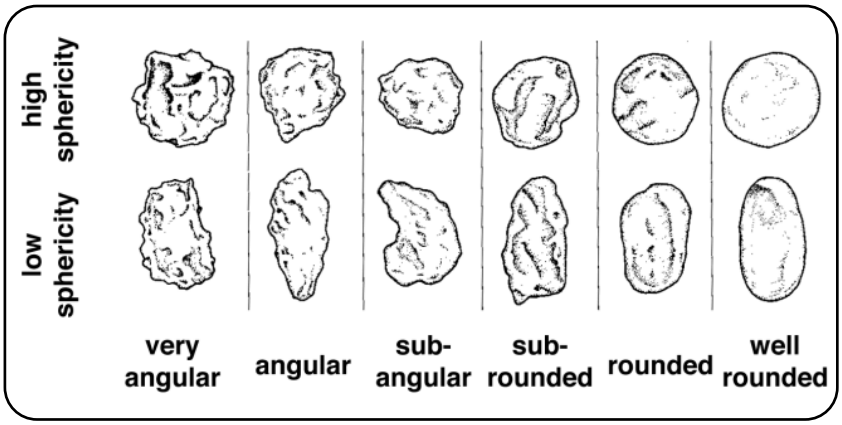
Stop 8: Glaciation

Q1. Look at the clasts that make up the periglacial head. How many different rock types are there and what is the dominant rock type?

There are a few clasts of calcite but over 99% of the clasts are limestone.

Q2. Using the categories in the diagram below, what is the average roundness of the clasts in the periglacial head deposit?

Periglacial head



Power's Roundness Chart

The clasts are manly very angular, but with some in the angular category.

Q3. Bearing in mind your answers to questions 1 and 2, where is the likely source of the material making up the periglacial head?

The clasts in the deposit are from local material and the clasts are angular because they have not been transported very far. This means the source is likely to be just up slope of where the deposit currently sits.

Wind-blown sand

Stop 9: Shear zone

Q1. Draw a field sketch of the shear zone. Label your sketch to indicate the direction of movement across the shear zone.

Remember to add a scale and label your sketch

Q2. What is the difference between an oncolith and an ooid?

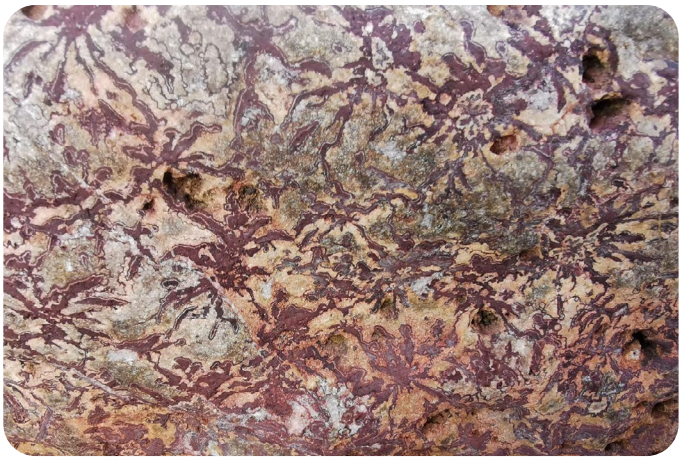
An oncolith is formed by layers of algae sticking sediment together. They form in agitated waters where the algal ball is constantly rolled around giving it a spherical shape. They can be up to a 1cm in diameter.
An ooid is usually much smaller than an oncolith, only around 1mm in diameter. They are non-biogenic and form when layers of calcium carbonate build up around a grain of silt.

Stop 10: Old haematite mine

Q1. What properties of haematite could you use to identify it in the field?

Colour: Black or brown to red
Hardness: 5-6 in most varieties but the earthy variety can be very soft with a hardness of ~2
Lustre: Metallic or dull and earthy
Streak: Cherry red
Density: It feels heavy for a mineral its size

Haematite and calcite vein fill



Haematite 'stars'

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Find the worksheet at www.s4science.co.uk/geotrails/geologytrails/braceletbay

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