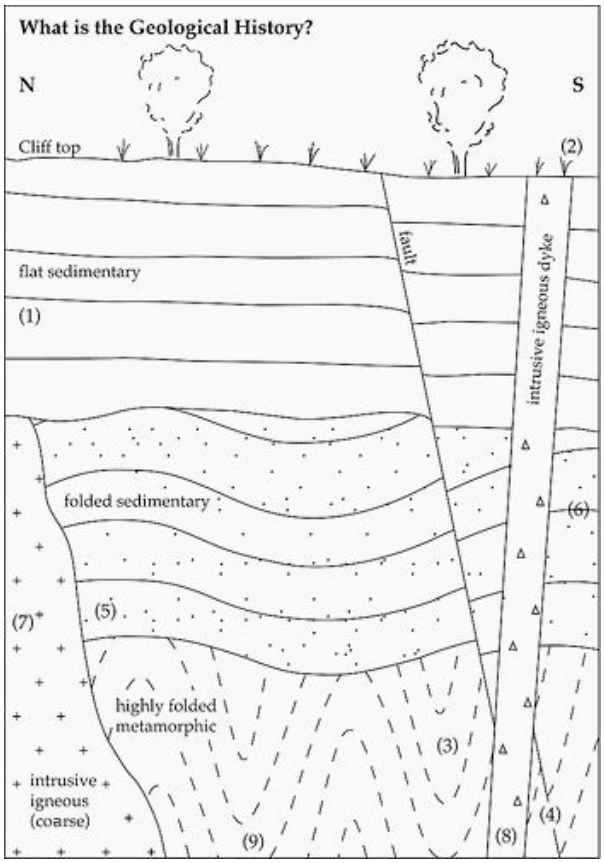
What is the geological history?

Sequencing events to reveal a history using simple stratigraphic principles

Using stratigraphic principles



Stratigraphic principles have long names, but are easy to use. Try using them to work out the sequence of events in a cliff face or in a picture of a cliff face, like this one.

Key sequencing principles are:

- The rocks on top are younger (unless something very unusual has happened to the rock sequence) – this is the **Principle of Superposition of Strata**.
- Anything which cuts across anything else is younger – this is the **Law of Cross-Cutting Relationships**.
- Rocks can only be deformed (folded, faulted or metamorphosed) after they have first been formed.

Use these principles to fill in the table opposite to show the sequence of geological events in the picture. Put the first event at the bottom, finishing with the last event at the top – this is the normal way of writing a series of geological events. The first has been done to help you.

Age	No.	Event
Last to happen, youngest		
Becoming younger		
First to happen, oldest	*9*	*Sediments were laid down as flat layers*

Reading the geological history of the UK
This cartoon diagram actually shows, in a simple way, the geological history of the UK. Read the summary of this history below, from the bottom of the page to the top.

A simple UK Geological History

- A flattish surface was eroded across the rocks; later erosion formed the cliff – **these were the last events to happen.**
- Magmas rose up some of the cracks forming intrusive igneous dykes.
- As the early Atlantic Ocean began to open, tension pulled the rock apart, it cracked and steep faults formed;
- Erosion produced another flattish surface; then more flat-lying sediments were deposited – and became rocks.
- The collision caused melting of part of the 'UK' plate and the magma rose to form coarse intrusive igneous rock.
- These sediments were compressed and folded as the plate carrying the 'UK' collided with the plate carrying Africa, which was moving north;
- Erosion produced a flattish surface; then more flat-lying sediments were deposited.
- Plate tectonics caused the plate carrying 'Scotland' to move south, colliding with the north-moving plate carrying England – compressing, highly folding and metamorphosing the rocks and forming the 'UK'.
- Sediments were laid down flat on the ocean floor between 'England' and 'Scotland' – **the first event to happen.**

Reading your own geological history
Try to draw a similar diagram for your region, so that pupils can work out the geological history in a similar way.

The back up

Title: What is the geological history?

Subtitle: Sequencing events to reveal a history using simple stratigraphic principles

Topic: Using simple principles to unravel the geological history of a diagram of a cliff face.

Age range of pupils: 11–19 years

Time needed to complete activity: 15 mins

Pupil learning outcomes: Pupils can:
- describe the principles used to sequence geological events;
- apply the principles to reveal the geological history from data provided.

Context:
Simple principles can be used to sequence the geological history from data provided by geological cross sections, maps, diagrams or rock exposures in the field.

Responses to the diagram above might be as shown opposite.

Following up the activity:
- Try drawing a cartoon cliff face to represent the geological history of your region and ask the pupils to interpret it, as suggested above.
- You could provide extra evidence and ask pupils to use the **Law of Included Fragments** by drawing boulders of highly folded metamorphic rocks (9/3) in the base of 5, by drawing included fragments (xenoliths) of 9/3 and 5/6 in the intrusive igneous rock (7) or by drawing boulders of 5/6 and 7 in the base of 1.

Underlying principles:
- Simple stratigraphic principles can be used to unravel the geological histories of apparently complex sequences.

Thinking skill development:
The application of sequencing principles involves seeking patterns (construction) and discussing the results (metacognition). Application of the principles to other situations, including real world ones, involves bridging.

Resource list:
- use the diagram above, or a similar one you have drawn yourself.

Useful links: See the Earthlearningideas, 'Laying down the principles' published on 14th April and 'Sorting out the sequence' to be published on 8th September 2008.

Source: Devised by Chris King of the Earthlearningidea team.
Diagram re-drawn by Dave King.

Age	No.	Event
Last to happen, youngest	2	A flattish erosion surface was cut across the top and the cliff formed. **We know the erosion surface came after the fault and dyke because it cuts across them (Cross-Cutting Relationships).**
Becoming younger	8	Magma intruded a fracture and solidified as an intrusive igneous dyke. **We know that the dyke (8) came after the fault (4) because it cuts it (Cross-Cutting Relationships).**
	4	The rocks fractured forming a steep fault with the south side dropping down, relative to the north side – caused by N-S tension. **We know that the fault came after the other events because it cuts nearly all the earlier rocks (Cross-Cutting Relationships).**
	1	A flattish erosion surface was cut and sediments were laid down flat on top – becoming sedimentary rocks. **We know that 1 comes after 7 and 5/6 because it is on top (Superposition of Strata) and cuts across the folded layers and the intrusive igneous rock (Cross-Cutting Relationships).**
	7	Igneous rocks intruded and cooled down slowly (coarse-grained). **We know that 7 intruded after 5/6 and 9/3 because it cuts across the layers (Cross-Cutting Relationships).**
	6	The sediments were compressed into folded sedimentary rocks – by N-S compression. **We know this comes after 5 because rocks cannot be deformed before they have first been formed.**
	5	A flattish erosion surface was cut and sediments were laid down flat on top. **We know that 5 comes after 3 because it is on top (Superposition of Strata) and cuts across the highly folded metamorphic layers (Cross-Cutting Relationships).**
	3	The sediments were compressed into highly folded metamorphic rocks – by N-S compression. **We know this comes after 9 because rocks cannot be deformed before they have first been formed.**
First to happen, oldest	*9*	*Sediments were laid down as flat layers*

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