Picturing trace fossils and other strange shapes

Visualise and draw trace fossils and sedimentary structures from a verbal description

Encourage pupils to look carefully at trace fossils and to describe them verbally so that another person can visualise them from the description.

Trace fossils are often confused with unusual sedimentary structures, and some of these are included, so that pupils may learn to distinguish between them. Like the trace fossils, these structures formed shortly after the actual deposition of the sediment.

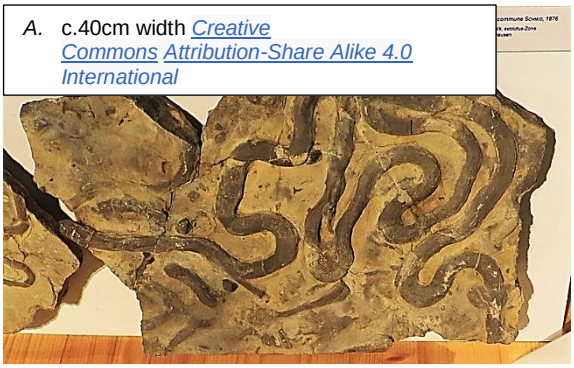
Seat pupils in pairs, with each person holding half of the photograph cards showing trace fossils or sedimentary structures, printed from those shown below. They should NOT show each other what cards they have in their hands.

Pupil A then examines one photograph and describes it as fully as possible to Pupil B, who listens carefully and then tries to draw it. Pupil B must listen in silence and not ask any questions. Pupil B then takes a turn with another card, with Pupil A doing the drawing, also in silence. Neither person should use any technical terms which describe the trace fossil or structure, e.g. 'burrow', but they may use more general words, such as 'holes' and may comment on directional properties seen on the photograph. Pupils should then compare their hand-drawn efforts with the photographs.

This first round should be tried without any guidance. Then give each participant the Prompt Card, to encourage them to be more specific in further descriptions, and ask them to work through the remaining photographs, comparing their drawings with the photographs after each round. Note that some trace fossils are repeated on different photographs.

When all have finished, give out the descriptive cards and ask pupils to match the descriptions to the photographs which they have been using.

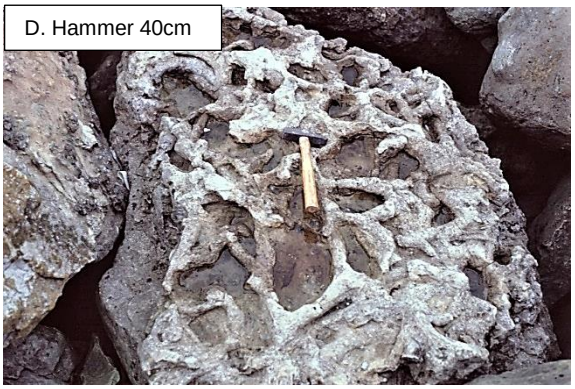
A. c.40cm width



B. Coin 2.5cm

C.

D. Hammer 40cm



E. Card 9cm long

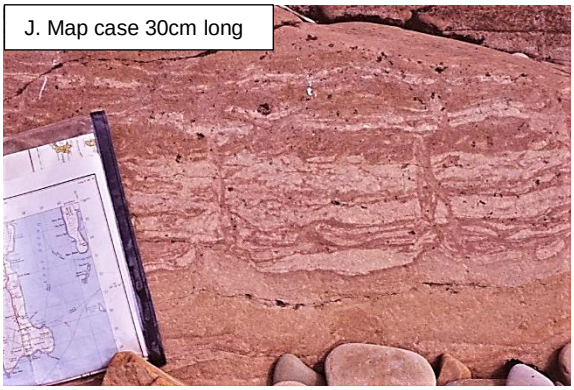
F.

G. Width 7cm

H. Field of view about 10m

I. Coin 2.5cm *GeoScenic | Image Details - P005137 (bgs.ac.uk)*

J. Map case 30cm long



K. Coin 2cm

L. Hammer head 8.7cm *GeoScenic | Image Details – P213122 (bgs.ac.uk)*

Descriptions of the photographs (Note that directions are only seen in two dimensions in the photos, so should be regarded as "apparent" directions.) Some specimens are upside down, or seen in section, so these notes must be read accordingly.

1. Bivalve burrow, seen in cross section. Analogy with the present day suggests that a bivalve had burrowed into soft sand as far as a different sediment beneath and has been living with extended syphons (tubes) protruding into the water above for food and oxygen.	7. "Sand volcanoes" in red sandstones and mudstones. The vertical lines show where a bubble of water, trapped in the wet sediment below, had escaped through newly deposited soft sediment above, probably forming a small cone on the sediment surface at the time.
2. Load cast. You are seeing the base of the specimen: it is upside down. The visible grain size is that of very coarse sand (and becomes smaller towards the true top of the specimen, although this cannot be seen in the photo). The sand was brought into a body of water by a turbidity current and settled out, pressing into the underlying beds as it did so, producing pillow-shaped load casts under its own weight.	8. Slump beds. Such deformation occurs when sediment has had time to settle out into layers but has not to begin to lithify. It is then shaken off, perhaps by a minor Earth tremor, and slips down slope, becoming contorted as it does so.
3. Trackway of a dinosaur-like reptile, showing the imprint of rear and front feet as the animal moved from right to left across a soft sediment, which later hardened. The photo shows a vertical cliff face, so the beds have been steeply tilted.	9. *Rhizocorallium* – a feeding trace, probably made by an annelid worm, keeping close to the surface of the sediment at the time, as it scoured the sediment for food.
4. Casts of the footprints of a small dinosaur (or maybe more than one animal). The animal walked in soft sediment which then hardened. This was later filled with sand. Now the original sediment is gone and the specimen is the base of the sandstone bed. Such three-toed prints are known as "tridactyl" prints.	10. A U–shaped burrow, known generally as *Diplocraterion,* seen in side section. The U-shape opens upwards, enabling such burrows to be used as way-up criteria. They were probably made by annelid worms, living in the inter-tidal zone.
5. Extensive interconnected burrows, probably made by crustacea (animals related to crabs) as they burrowed through loose sediment in search of food. Resin poured into the burrows of living crustacea in the Persian Gulf gave casts many metres in extent each way, matching these ones in the photo.	11. Cast of the rear foot of a large sauropod dinosaur, now seen as a loose specimen on the beach.
6. *Beaconites* (Named from the Beacon Supergroup, Antarctica). The photo shows the top view of several burrows, which in long section resemble the skeleton of a snake, made by a worm-like organism.	12. Bivalve burrows, seen from the base of a loose block, showing where each burrow had protruded slightly into the bed beneath. The "N.E. to S.W." alignment suggests response to a palaeocurrent, ensuring clean food supply and washing away of excreta in the river.

Prompt Card
Use this card as a check list to aid your verbal description of your photographs to your partner
What is the size of the specimen, or of the sequence of rocks in the field?
Comment, where appropriate, on features seen: **in** the bed; **on** the bed; **under** the bed
Does the colour give any clues?
Is there evidence of the way-up of the specimen or rock sequence?
Did the features form at the time when the original sediment was laid down, or afterwards?
Decide whether the photo shows a trace fossil or a sedimentary structure.
Try to give it a descriptive name.

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The back up

Title: Picturing trace fossils and other strange shapes

Subtitle: Visualise and draw trace fossils and sedimentary structures from a verbal description

Topic: Enhancing pupils' skills of description and interpretation using photographs of trace fossils and sedimentary structures

Age range of pupils: 14 years upwards

Time needed to complete activity: About 30 minutes, depending on depth of discussion

Pupil learning outcomes: Pupils can:

- examine photographs of trace fossils and sedimentary structures carefully and describe them intelligibly;
- listen carefully to a verbal description and interpret it in a drawing;
- demonstrate their understanding of the nature and origin of trace fossils and sedimentary structures;
- suggest modes of life of the original organism;
- recognise that some structures in the photographs are upside down;
- enhance their observational skills as a prelude to field work.

Context: This could form a useful revision activity, once pupils have studied sedimentary rocks and fossils. Answers to the matching exercise are:

A9	B4	C12	D5	E11	F2
G1	H3	I8	J7	K10	L6

Following up the activity:

- Adopt the same approach to real specimens, if you have them, or to photographs of other items of geological significance.
- Ensure that pupils use the same careful description and interpretation approach to geology in the field.
- Ask pupils to examine the photograph of *Diplocraterion* below and say if there is any evidence of which way (up or down) the creature had last moved in its burrow. (*The curved "spreite" marks on the inside of the U shape suggest that the animal had been working downwards, as sediment was eroded from above. However, there are also spreite marks below the U shape, in the same dark colour as in the U tube itself. This implies that the animal had later been moving up in its burrow, in response to accumulation of sediment above. Where the spreite marks occur both below and above the base of the U-shape, the creature is referred to as Diplocraterion yoyo!*

Diplocraterion
Coin 2.3cm. *(Photo: Rowland Barter)*

Underlying principles:

- Trace fossils indicate where a living organism has been, even though the body fossil has not been preserved at that spot.
- Many trace fossils are easily confused with features of inorganic origin.
- Trace fossils and sedimentary structures provide essential clues to their environments of deposition.
- The trace fossils and sedimentary structures shown here are all post-depositional features, i.e. features formed after the sediment had first been laid down.
- This strategy provides training in careful observation and interpretation of all relevant features.
- Being obliged to give a verbal description encourages careful observation, to ensure that clues are not missed.

Thinking skill development:
Verbal dexterity and metacognition are encouraged by the need to give intelligible verbal descriptions and to interpret from them**.** Mental patterns are constructed of the relationship between trace fossils and their origins. Applying the activity to real specimens or to the field situation is a bridging activity.

Resource list:

- Card sets of Photographs, Prompt Cards and Description Cards, cut out from those shown above.
- If real specimens are available these may be used instead, with appropriate matching descriptions drawn up by the teacher (although it is harder to hide real specimens from each other).
- A ruler and protractor per pair might encourage accurate observation and description.

Useful links: Search for "trace fossils" on www.earthlearningidea.com
See the table below for other Earthlearningidea activities in the "Picturing" series.

Source: Written by Peter Kennett of the Earthlearningidea Team. Photos by P. Kennett, unless otherwise shown.

Picturing……

Earthlearningidea has compiled a series of activities involving examination of photographs of geological interest and their careful verbal description to others. This table will be updated as fresh activities are added. All titles begin with: “Picturing……”

Title	Sub-title
Puzzle structures	Visualise and draw sedimentary structures from a verbal description
Trace fossils and other strange shapes	Visualise and draw trace fossils and sedimentary structures from a verbal description
Igneous rocks – 1	Visualise and draw igneous rocks from a verbal description
Igneous rocks – 2	Visualise and draw igneous rocks from a verbal description
Metamorphic rocks	Visualise and draw metamorphic rocks from a verbal description
Tectonic structures – 1 faulting	Visualise and draw fault structures from a verbal description
Tectonic structures – 2 folding	Visualise and draw fold structures from a verbal description
Minerals -1	Visualise and draw minerals from a verbal description
Minerals -2	Visualise and draw minerals from a verbal description
Fossils -1	Visualise and draw fossils from a verbal description
Fossils -2	Visualise and draw fossils from a verbal description
Landforms 1	Visualise and draw landforms from a verbal description
Landforms 2	Visualise and draw landforms from a verbal description