Sedimentary structures - imbrication
Which way did the river flow?

Sedimentary rocks often contain clues about their origins. Sediments which were deposited by fast-flowing currents in rivers or on beaches may demonstrate **imbrication**, where rock fragments were pushed in one direction by the current so that they overlap each other.
Demonstrate this principle by setting up a row of dominoes as shown in Photograph 1. Use a pencil to push them over, so that they overlap each other as seen in Photograph 2. Ask pupils to observe the overlap and ensure that they can tell which way the pencil was pushed.

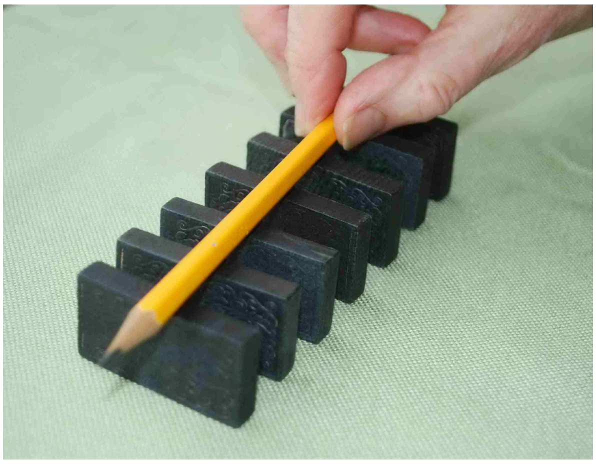

Photo 1: Dominoes set up on the table

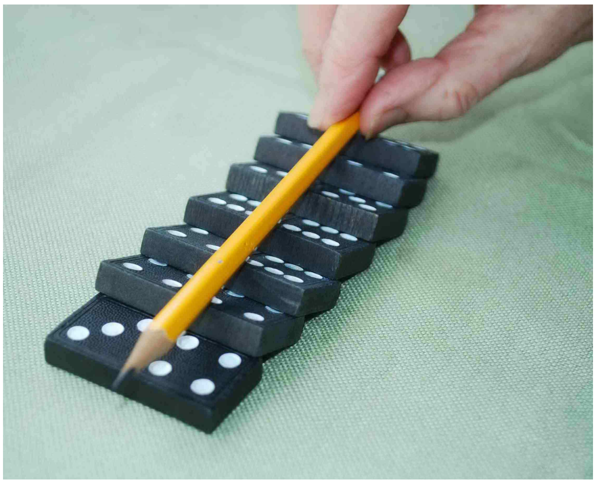

Photo 2: Dominoes pushed flat

Repeat the activity, without the pupils watching, and then ask them if they can tell which way you pushed the pencil.

Show pupils the first photo of rock fragments on a river bed (Photograph 3) and ask them which way they think the river had been flowing.

Photo 3: Rock fragments showing imbricate fabric on a modern river bed in Mid Wales

Then show the rest of the scene (Photograph 4), for them to see if they were correct.

Photo 4: The same scene as in Photo 3, showing the river current (flowing from left to right)

Triassic-aged conglomerate beds in the south of England are formed of imbricated pebbles that slope downwards towards the South. Which way was the current that deposited them flowing? (*Answer - towards the North*)

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The back up

Title: Sedimentary structures 2 – imbrication

Subtitle: Which way did the river flow?

Topic: A teacher demonstration (or a small group activity) showing the origins of imbrication in sedimentary rocks.

Age range of pupils: 11 – 18 years

Time needed to complete activity: About 10 minutes

Pupil learning outcomes: Pupils can:

- observe the outcome of a simple demonstration;
- understand how imbrication may be formed in the natural world and its significance in interpreting past environments;
- study photographs carefully and discuss the evidence of modern and past environments which are shown.

Context: This activity can be used in any lesson dealing with the origin of sediments and the interpretation of past environments.

Following up the activity:

- Ask pupils to study Photographs 5 and 6, to identify where imbrication occurs and to say which way the ancient current was flowing. (*In each case, the apparent current flow was from left to right. It has to be remembered that the photographs give a two dimensional view, and so the current could have been flowing either into or out of the page, to some extent.)*

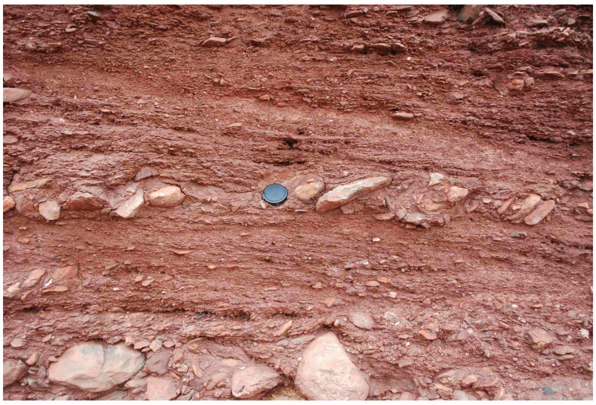

Photo 5: Imbrication in sedimentary rocks of Permian age in Torbay, Devon

Photo 6: Imbrication in sedimentary rocks of Permian age in Torbay, Devon
(Photos: *All photos are by Peter Kennett*)

- Ask pupils to look out for imbrication in any modern streams that they come across and see if the pattern they have established is maintained.

Underlying principles:

- Strong currents often push rock fragments on top of each other, in overlapping sequences.
- The direction of slope on each rock fragment points towards the source of the current.
- The effect is NOT caused by one domino (or rock fragment) simply hitting the next one and causing the usual collapse or “domino effect”.
- The influence of ancient currents is frequently preserved by imbricate fabric in the sequence of rocks.
- Ancient currents are known as *palaeocurrents*.
- The terms *imbrication* and *imbricate fabric* are derived from the Latin for *tile,* since the appearance is similar to the overlapping tiles on a roof.

Thinking skill development:
Thought processes of construction are involved when observing the outcomes of the demonstration. Recognising current directions in ancient sediments may involve cognitive conflict and metacognition is used when pupils discuss the activity. Bridging skills are needed to relate the domino observations to the real world.

Resource list:

- about six dominoes or similar uniform shaped objects
- a long pencil
- access to the photographs above

Source: Written by Peter Kennett, following a suggestion by Chris King, both of the Earthlearningidea Team.