

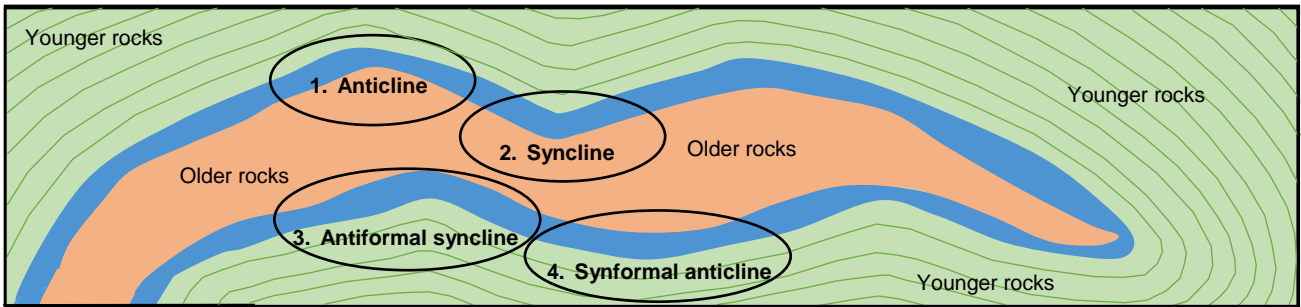
Right way up or upside down? - modelling anti- and synforms by hand

Use your hands to show how the beds in folds can be the right way up or inverted

Downfolds in rocks are called synforms and upfolds are called antiforms.

When sedimentary and extrusive igneous rocks are deposited, the oldest rocks are always laid down first with the younger ones on top. When these normal sequences are folded, synforms are called synclines and antiforms are called anticlines – so nearly all upfolds on Earth are anticlines and downfolds are synclines.

However, sometimes during the plate collisions that produce mountain zones, whole sequences can be overturned in large overfolds called nappes, so that the youngest rocks are at the bottom and older rocks at the top, as in the cross section drawn below. When this happens the downfolds are synformal anticlines and the upfolds are antiformal synclines. So, when we do not know if a sequence has been turned upside down or not, we refer to all downfolds as synforms and upfolds as antiforms.



Cross section of a large overfold structure or nappe: folds 1 and 3 are antiforms and folds 2 and 4 are synforms.

These structures can be shown using your hands. In each of these photographs, the palm of the

hand is the oldest rock and the top of the hand the youngest rocks.



1. Anticline.



2. Syncline.



3. Antiformal syncline



4. Synformal anticline

Rock sequence folding over into a nappe structure.

The back up

Title: Right way up or upside down? - modelling anti- and synforms by hand.

Subtitle: Use your hands to show how the beds in folds can be the right way up or inverted.

Topic: A hand-modelling activity to show how different types of synforms and antiforms can be produced.

Age range of pupils: 14 years upwards

Time needed to complete activity: 5 minutes

Pupil learning outcomes: Pupils can:

- describe the two different types of antiforms and synforms;
- model these with their hands.

Context:

Most rock sequences have not been inverted, so that antiforms are anticlines, with the oldest rocks in the centre and the younger rocks on the outside. Similarly, in non-inverted sequences, synforms are synclines, with the oldest rocks on the outside and the youngest rocks in the centre of the folds.

It is only when sequences have been inverted by huge nappe structures that, in the inverted part of the fold, antiforms are antiformal synclines and synforms are synformal anticlines.

These differences show the importance of 'way-up structures', which are used to find out if a sequence is the right way up or inverted. Put 'way-up' into the Earthlearningidea search engine to find activities about 'way-up' structures, and how they are formed and used.

The educational advantages of using your hands to model geoscience features and processes have been explained in the Earthlearningidea, *Rock cycle at your fingertips*.

Following up the activity:

Ask pupils to think of other ways of modelling the effects of inverted sequences on folding.

Underlying principles:

- The formation of the two different types of synforms and the two different types of antiforms can be modelled with your hands.

Thinking skill development:

Modelling the three-dimensional development of different fold types is a construction activity, requiring bringing to the 'real world' to be understood in structural geological terms.

Resource list:

- just your hands

Source: Devised by Chris King; photos by Peter Kennett, both of the Earthlearningidea Team.

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The Earthlearningidea hand-modelling activities	
Modelling Earth processes	The rock cycle at your fingertips: modelling the rock cycle with your fingers
	Plate margins by hand: modelling plate margins and plate movement with your hands
	Modelling by hand 'when the youngest rock is not on top': illustrating how rock sequences can have older rocks on top of younger ones
	Modelling unconformity – by hand: using your hands to demonstrate how unconformities form
Modelling structural geology nomenclature	Modelling Earth stresses isometrically: using your hands to model Earth stresses
	Modelling folding – by hand: using your hands to demonstrate different fold features
	Right way up or upside down? - modelling anti- and synforms by hand: use your hands to show how folds can be the right way up or inverted
	Visualising plunging folds - with a piece of paper and your hands: using your hands and folded and torn paper to show the patterns made by plunging folds
Climate change activities	Modelling faulting – by hand: using your hands to demonstrate different fault features
	The Earth during Milankovitch cycles – by hand: modelling the Earth's squashed orbit, tilt and wobble using your hands
	Modelling tipping points – by hands: demonstrating tipping points in the Earth's system with the hands of three pupils