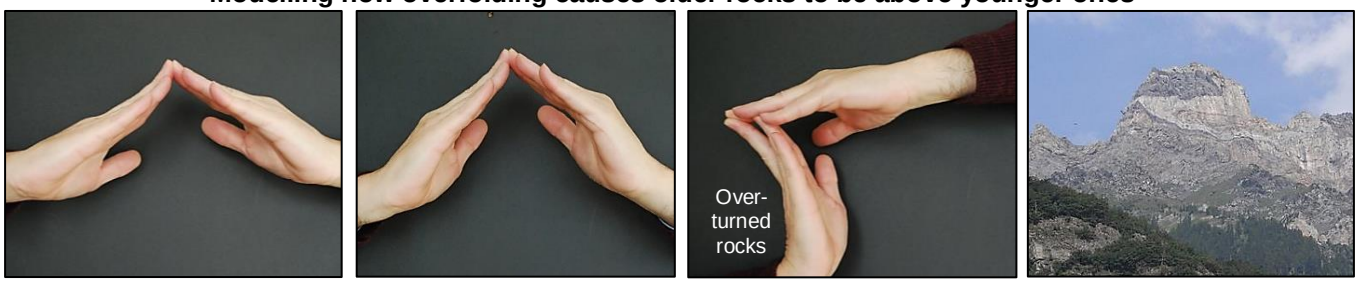
Modelling by hand 'when the youngest rock is not on top'
Illustrating how rock sequences can have older rocks on top of younger ones

According to the 'Superposition of strata' principle, the youngest rock in a sequence is the one at the top. However, this is a principle and not a law – meaning that there are unusual conditions when an older rock can be on top of a younger one.

These unusual conditions can be modelled using your hands.

Modelling how overfolding causes older rocks to be above younger ones

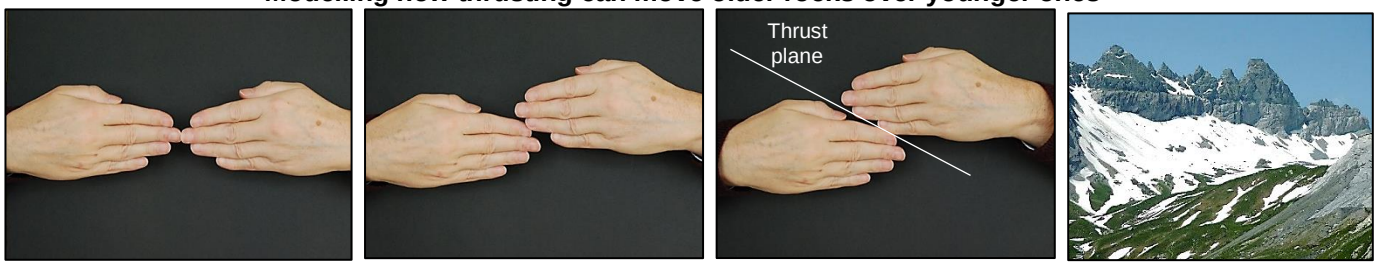


Overturning sequence, where the older rocks, represented by the palm of the hand on the left, end up above the younger ones, represented by the back of that hand.

Dent de Morcles, Valais, Switzerland.

The photo shows the overturned fold of Dent de Morcles in the Swiss Alps, where the top part of the fold has been overturned so that the oldest rocks are above younger ones.

Modelling how thrusting can move older rocks over younger ones



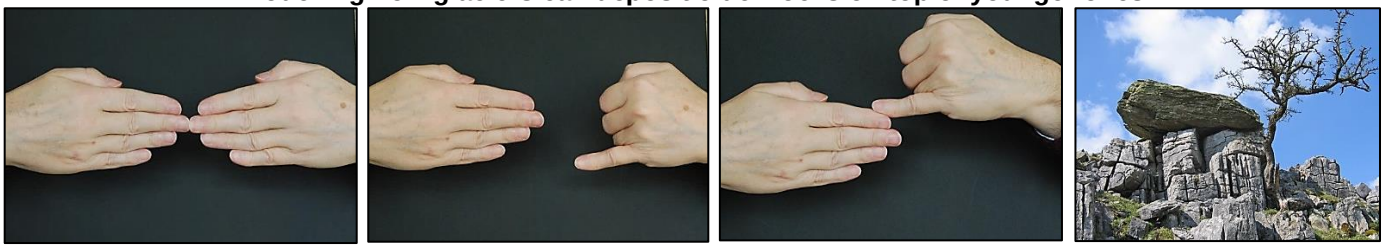
Little fingers-same age rocks at base.

Little finger - old rocks above younger.

Glarus Thrust in the Swiss Alps.

The photo is of the Glarus Thrust in the Swiss Alps, where the rocks above the near-horizontal thrust line are older than the ones underneath.

Modelling how glaciers can deposit older rocks on top of younger ones



Little fingers-same age rocks at base.

Rock above little finger eroded.

Little finger - rock laid on top by glacier.

Glacial erratic, Norber, Yorkshire.

The photo is of a glacial erratic of older Silurian sandstone deposited by a melting ice sheet on top of younger Carboniferous limestone, at Norber in Yorkshire, UK.

The back up

Title: Modelling by hand 'when the youngest rock is not on top'.

Subtitle: Illustrating how rock sequences can have older rocks on top of younger ones.

Topic: A class activity to help pupils to visualise the unusual conditions that cause older rocks to be found above younger ones, through modelling with their hands.

Age range of pupils: 14 years upwards

Time needed to complete activity: 5 minutes

Pupil learning outcomes: Pupils can:
- describe different ways of older rocks being found above younger ones;
- model them with their hands.

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

While the 'Principle of superposition of strata' states that younger rocks are found above older ones, there are certain unusual geological conditions causing older rocks to be found on top of younger ones. Through this activity, pupils can model the unusual geological conditions where the 'Principle of superposition' does not apply.

Following up the activity:
Pupils could be asked to think of different ways of modelling the unusual conditions where the 'Principle of superposition' does not apply.

Underlying principles:
- Through rock deformation causing one fold limb to be overturned, older rocks are found above younger ones.
- Where there are large scale thrust planes, older rock sequences can be thrust over younger ones.
- Melting ice sheets or glaciers can deposit older glacial erratics on top of younger bedrock.

Thinking skill development:
Modelling the conditions where the 'Principle of superposition of strata' does not apply requires construction of the processes, abstract modelling and bridging to real world circumstances.

Resource list:
- a pair of hands

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

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
	Modelling faulting – by hand: using your hands to demonstrate different fault features
Climate change activities	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