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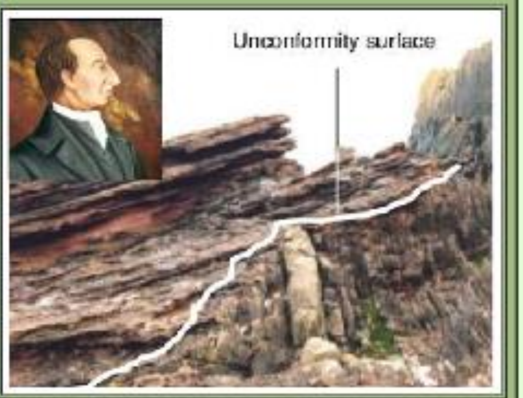
Popular activity in July 2016:-
James Hutton – or 'Mr. Rock Cycle'?
Thinking towards the rock cycle, the Hutton way



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NEW ELI

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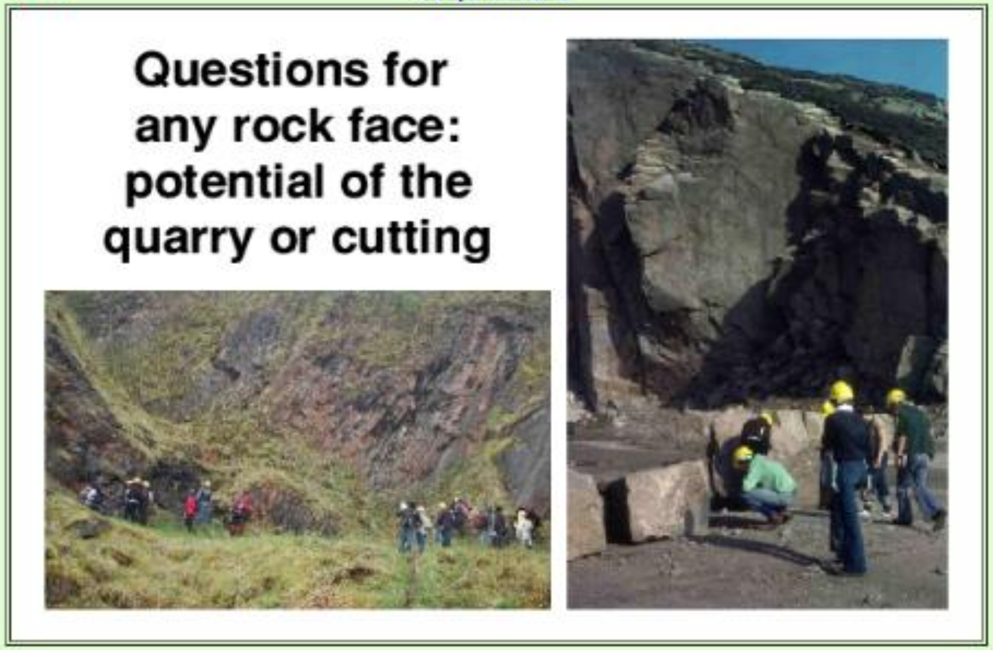

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ELI in the world

Activities related to the New ELI:-

- Quarry through the window; what would you see, what would you not see?
- Roadstone - which rock?

GIFT Workshop, Cape Town
Sat/Sun 27/28th August 2016

Earthlearningidea hands on - Chris King

Riches in the river

Riches in the river

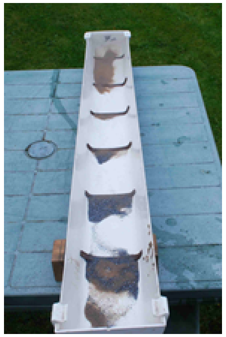
Investigating how valuable ores may become concentrated on river beds

Show pupils a cup of sand with glistening metallic particles in it. Pretend that the glistening particles are gold. How could we separate the 'gold' from the sand? Remind them of some of the properties of gold, including the fact that it is very much more dense than sand.

When the pupils have made their suggestions, show them a length of gutter with thin baffles (low barriers) glued across it, a block of wood and a bucket of water. Ask them how this equipment could be used to separate the 'gold' from the sand. Follow the pupils' suggestions in a demonstration. Then, if they have not thought of it for themselves, show how it may be done. Rest one end of the gutter on the wood block and let the other end drain into a bucket. Add about 50ml of the sand/'gold' mixture to the top of the gutter and then very gently trickle water down over it, from a jug. The less dense sand washes over the baffles and comes to rest in the lower end of the gutter, but most of the dense 'gold' remains trapped behind the top two or three baffles.

This process happens in real rivers, where gold and ores of other dense metals settle out behind obstructions on the river bed.

The gutter set up on a wooden block ready for action



View from the top end of the gutter showing how the dense ore is trapped behind the top three baffles, whilst the sand is washed to the bottom

The second demonstration models a bend in a river, but here it is a continuous bend! Pour about 10cm depth of water into a round flat-bottomed bowl. Place a round object in the middle of the bowl, to represent the inner bank of a meander. Sprinkle about 75ml of the sand/'gold' mixture evenly onto the base of the bowl and jiggle the bowl slightly to even out the layer.

Using a dessert spoon or similar object, gently stir the top 2 cm or so of the water round and round, for a few minutes until the sand moves along the bed to form shapes. (Do **not** stir the sand itself).

The 'gold' settles out behind the newly formed ripple marks, whilst the sand keeps sweeping over the crest of each ripple mark. Where the current is fastest, on the outside of the bend, the sand may be swept clear, leaving behind the dense 'gold'.

The 'continuous river bend' model set up with an even layer of sand and dense ore

Ripple marks formed in the sand, with the dense ore trapped behind each ripple
(All photographs by Peter Kennett)

Ores which become concentrated in moving water, as in these two activities, are referred to as **placer deposits.**

The back up

Title: Riches in the river

Subtitle: Investigating how valuable ores may become concentrated on river beds

Topic: Investigating the importance of differences in density of sand and a valuable ore, to see how the ores may become concentrated by the action of moving water.

Age range of pupils: 10 – 18 years

Time needed to complete activity: About 10 minutes for each activity

Pupil learning outcomes: Pupils can:
- explain how moving water can separate particles of different density;
- predict where best to look for gold and dense ores on a river bed;
- explain how density differences can be used to separate valuable ores from less dense waste in a commercial situation.

Context: The activity could be used in a lesson on sedimentary processes, or to show the economic value of density differences in a physics lesson. Some pupils may live in countries where the commercial extraction of placer deposits is an important contributor to the national economy.

If you have water from the tap available, the water can be run down the gutter from a pipe, instead of using a jug.

Following up the activity:

Try the Earthlearningidea activity, 'Sand ripples in a washbowl' to investigate more fully the ways in which sand behaves in moving water.

Ask pupils to devise other ways of separating ores from sand.

Carry out a web search for the techniques used by mineral extraction companies to separate the ore from the waste. This will include the process known as froth flotation.

Underlying principles:
- Loose particles in moving water are either carried in suspension, or are dragged along the bottom as bed-load.
- As the sand particles move downstream ripple marks develop in the sand.
- The sand that is dragged up the shallow slope of the ripple mark is carried over the top and is deposited by eddies travelling up the front (steep) slope of the ripple mark, depositing sand on this steeper slope.
- Dense ores settle in the trough areas of the ripple marks, which are protected from the main water current.
- Density differences have long been used to separate valuable ores from the lower density waste material. The process featured above is called 'buddling'. 'Jigging' is a process whereby a container of ore and waste is jigged up and down in water, which pulses though the open mesh base of the container.
- Modern separation of ores from waste is mostly done by froth flotation, which depends more on the chemical properties of the materials than their densities.

Thinking skill development:

Pupils observe the patterns forming in the ores and the sand in both activities (construction). They reason why the ore remains behind (metacognition) and apply their findings to the commercial world (bridging).

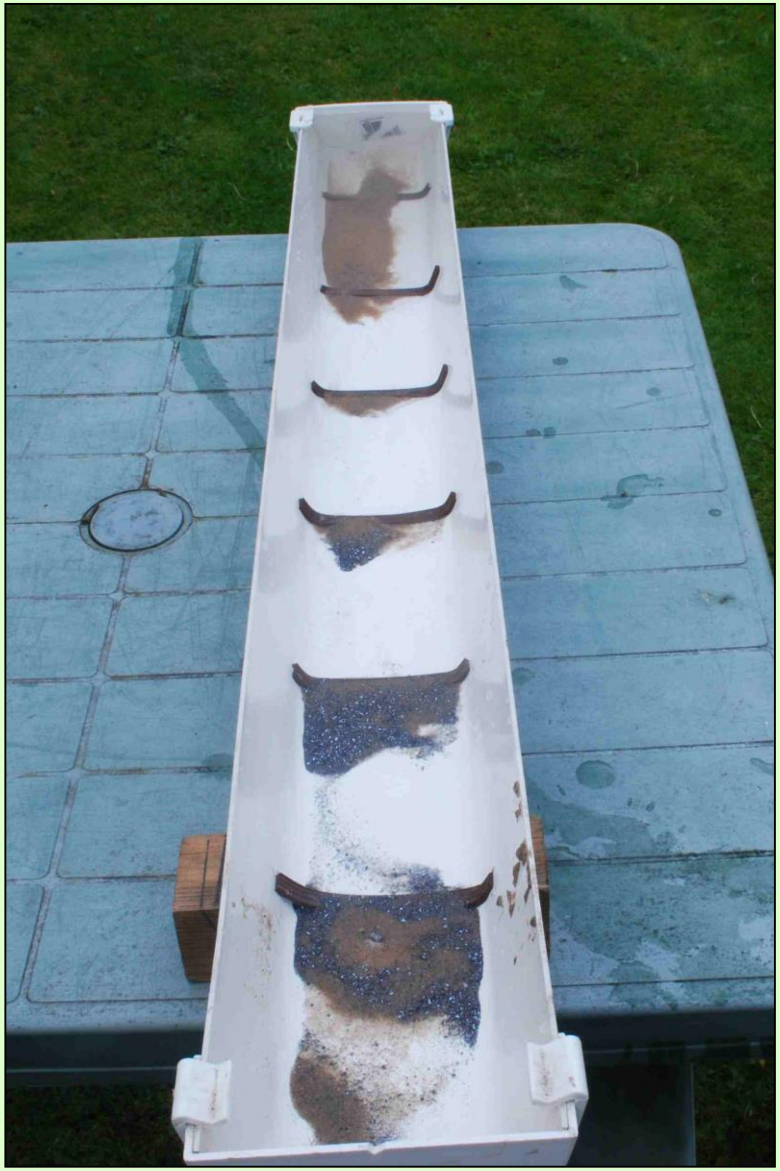
Resource list:
- gutter with baffles (low barriers about 0.5 cm high) glued across the gutter at 10cm intervals. (Self-adhesive draught excluder is easy to use)
- washed medium-grained sand
- particles of dense metals or metal ores, e.g. crushed pyrite or galena, brass turnings, iron filings, etc. The photographs show galena particles produced by crushing galena between two hammers, sieving through a kitchen sieve to remove the larger fragments and washing in water to remove the grey dust.
- jug
- bucket
- water
- small block to raise one end of the gutter
- round flat-bottomed bowl.
- round object placed in the middle of the bowl,
- dessert spoon

Useful links:

http://www.ectonhillfsa.org.uk/Geology_pdf_files/GW7_SS1_What_makes_an_Ore_Deposit_worth_Mining.pdf

Source: Adapted by Peter Kennett of the Earthlearningidea team from the Earthlearningidea activity 'Sand ripples in a washbowl' and from 'Earth Science Experiments for A Level', Mike Tuke, Earth Science Teachers' Association, on CD Rom.

Riches in the river



Jigging


Earthlearningidea - http://www.earthlearningidea.com/

Jigging
Using density to separate different materials

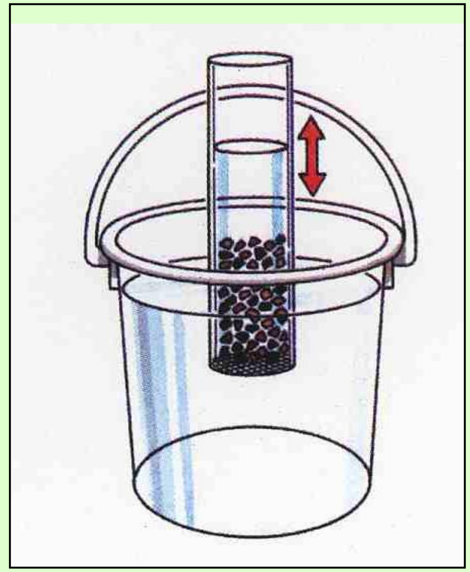
Jigging separates materials of different density by shaking under water – and can easily be done in the classroom, lab or field. You can try jigging with several different sorts of mixtures, so long as there is a range of density of the constituents. The diagram shows a mixture of coal and shale, and the close-up photograph shows a mixture of the minerals galena, barite, fluorite and calcite (in that order from the base). We shall describe the latter.

Show the pupils a large sample taken from a mineral vein, containing several different minerals. Tell them that each mineral has economic value, if only it can be separated from the others. Ask them how they think the minerals could be separated.
Then, either demonstrate how minerals can be separated by 'jigging', or ask small groups of pupils to try it for themselves. Add the 'charge' of mixed crushed minerals to the top of a jig, made from a plastic tube, to the base of which a piece of gauze has been fixed (See 'Resources'). Shake the tube of minerals vigorously up and down in a bucket full of water (the deeper the water, the better) and continue until a good measure of separation has been achieved. The photograph shows that if minerals of widely differing density and colour are used, the effect can be dramatic. Ensure that the materials are retained for future use.
Point out that this method was used for several centuries by miners, who mainly wanted the lead ore, called galena. Ask pupils how they could get the galena out of the jig. Then show them the photograph of the full scale reconstruction, and point out that it was big enough for a boy to climb in and shovel out the minerals from their different layers.

The apparatus – a jig and a bucket full of water (redrawn from 'Power from the past: coal'. ESTA)

A jig being used to separate galena, barite, fluorite and calcite from a crushed sample

A full-size reconstruction of a jig on the ore-dressing floor at the Kilhope Mining Museum, County Durham



Interactive hydrothermal mineralisation

Interactive hydrothermal mineralisation
'The rock with the hole' hydrothermal mineralisation demo

This activity demonstrates how hydrothermal minerals form. It could be used as a simple illustration of the processes with minimal pupil involvement. But it can also be used as an interactive demonstration, to engage pupils in the thinking behind a scientific enquiry, as follows. Keep the apparatus and materials hidden from the pupils until they are needed.

1. Show pupils a photo of a mineral vein with a gap remaining in the middle, like this one.

A vein of the purple 'Blue John' variety of the mineral fluorite in a vein in the Peak District of England.

Neilwalker at en.wikipedia published this image under the GNU Free Documentation License, Version 1.2

2. Ask them how the minerals could have got there.
A. There must have been a hole in the rock through which the minerals came.
3. Show them a hand-specimen-sized rock with a hole in the middle, and ask, 'Is this the sort of hole you mean?'
A. Yes

The apparatus Photo: Chris King.

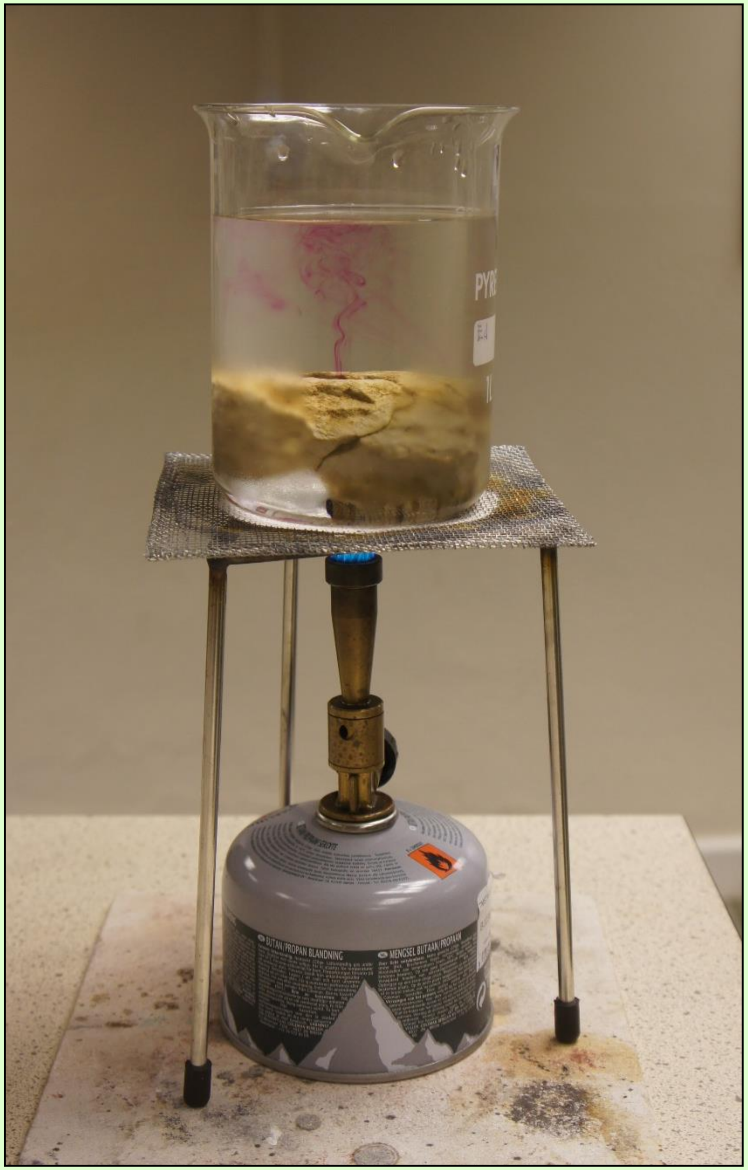
4. Tell them that rocks like this were originally formed without containing minerals like these; they were part of rock sequences underground. Ask them how the chemicals to form the minerals could have got into the hole.
A. They must have been brought in by a fluid – a liquid is most likely, eg. water.
5. If they wanted to fill the hole in the rock with water, in the most natural way, ask how this could be done.
A. Put the rock in a beaker and fill it with water until the rock is well covered.
6. Ask whether the water bringing the mineralising chemicals into the hole is most likely to flow in from above or below.
A. From below, since there is much more rock that the mineralising fluids could have come from below rather than above.
7. Ask, how we could get water currents to flow through the hole in the rock, from below.
A. By heating the water from below.
8. Ask why heating water would cause it to rise.
A. Hot water rises, because it expands on heating and so has a lower density than the surrounding water.
9. Ask how we could make water rising through the hole visible and how we could show it was containing chemicals.
A. Add coloured material to the water below the hole that will dissolve and colour the liquid.
10. Place a fine glass tube into the hole and, use tweezers to pick up and drop a crystal of potassium permanganate down the hole, then remove the tube.
11. Heat the beaker and watch the plume of permanganate-coloured liquid rise through the hole (the permanganate happens to be the same purple colour as the 'Blue John' in the photo above).
12. Ask, when the hot liquid containing dissolved minerals is naturally flowing upwards through underground holes such as cracks and joints, what causes the minerals to crystallise on the walls of the crack to form mineral veins.
A. As the fluids cool, minerals crystallise.

A plume of purple potassium permanganate -dyed liquid rising through the hole, on heating.

Photo: Chris King.

This demonstration can be carried out in the lab, but is even better done in the field, beside a mineral vein, using a camping heater.

Interactive hydrothermal mineralisation



Smelter on a stick

Earthlearningidea - http://www.earthlearningidea.com/

A smelter on a stick
Smelting iron ore to iron on a gas burner

Iron metal does not occur as such in nature. It reacts too easily with other elements to form compounds such as iron oxide, which are known as **iron ores**.

Demonstrate how iron ore can be smelted to iron, using a "micro-smelter" on a gas flame.

Hold a small wooden stick (e.g. a coffee stirrer) in a hot blue gas flame for a few seconds. Try to char it, rather than letting it burn too much, and put the flame out by wetting it. Explain that the black material you have made is charcoal, which was used to extract iron metal from iron ore in the days before industry used coke (made from coal), instead.

Dip the charcoal end of the stick into powdered iron (III) oxide (iron ore), until it has become coated with the powder.

Put the coated end of the stick into the hot blue flame and heat it until it glows orange.

Stub it out and grind the result to ash in a pestle and mortar, or by using a weight, as in the photograph.

Stroke the ash with a small bar magnet, and look for tiny crystals of iron sticking to the magnet.

Show pupils that the iron (III) oxide powder does not stick to the magnet, so a chemical change must have taken place, as follows:

$$2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$$

iron(III) oxide, carbon, iron, carbon dioxide

Pupils may like to retain the iron crystals by picking them up on sticky tape and mounting them in their books.

Step 1 – making a 'charcoal stick'

Step 2 – dipping the charcoal stick into iron oxide powder

Step 3 – smelting iron oxide with charcoal

Step 4 – picking up iron crystals with a magnet, after crushing
(Photos: *Heidi Dobbs, RSC*)

Step 1 – making a 'charcoal stick'

Smelter on a stick

Step 2 – dipping the charcoal stick into iron oxide powder'

Step 3 – smelting iron oxide with charcoal

Step 4 – picking up iron crystals with a magnet, after crushing

Wax volcano – kimberlite intrusion

Volcano in the lab
Modelling igneous processes in wax and sand

Prepare a 500 ml glass beaker as described under "Resources" and place it on a tripod, ready to light the Bunsen. Before the Bunsen is lit, ask the class to predict what will happen as the contents of the beaker heat up. If they need prompting, you could ask them:

- Which will melt first – the wax or the sand? (*The wax*);
- What will happen to the wax once it has melted? (*It will rise*);
- Why will it rise? (*Molten wax is less dense than water*);
- Will any of the molten wax reach the top of the water? (*Yes – at least some of the wax usually erupts onto the surface of the water and spreads out to form a sheet of molten wax*).
- Will any of the molten wax set in the water? (*Yes, especially if the water has been chilled beforehand*);
- Will the molten wax convect round the beaker? (*No – the beaker is too restricted and the wax is too buoyant*).

Then heat up the beaker and ask students to watch carefully throughout, from behind a safety screen. Quite often, very little seems to be happening, until the wax suddenly rises. Ask how it is that molten wax can reach all the way to the surface, even though the water around it is quite cold (*quite often, a tube of wax forms in the water, through which the rest of the wax rises, effectively insulated from the surrounding water by the consolidated wax tube*).
(Remove the Bunsen whilst there is still a little wax left on the bottom of the beaker).

The wax volcano – a surface "lava flow" is fed by three feeder pipes, with "intrusions" building up near their bases. See page 3 for successive photos of the activity).
(Photo: *Peter Kennett*)

The back up

Title: Volcano in the lab

Subtitle: Modelling igneous processes in wax and sand

Topic: Modelling the rise of "magma" through the "crust", and observing how some of it can erupt onto the surface, representing a lava flow, whilst some sets within the water mass, representing an igneous intrusion.

Age range of pupils: 12 – 18 years

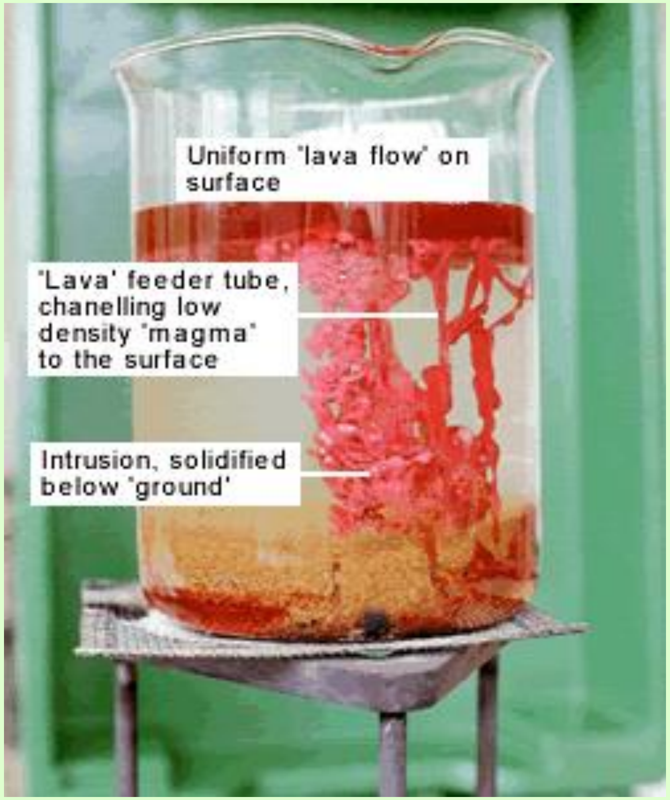
Time needed to complete activity: 10 minutes for the activity, plus about 15 minutes to set up the beaker.

Pupil learning outcomes: Pupils can:
- make predictions based on their previous experience of heating materials;
- debate their detailed predictions with each other;
- observe a sequence of events accurately and explain the outcome;
- describe how the model relates to reality;
- explain how magma can either reach the surface to produce volcanic eruptions, or set below ground to form intrusions.

Context: The activity can be used during the course of both science and geography lessons to illustrate the principles of igneous activity, both above and below ground.

Following up the activity:
Discuss the applications of the model to the real world, e.g.
- The sand and water represent the layers in the Earth's crust;
- The wax represents the upper mantle, which is normally solid, but may be locally melted at a point source;
- Just as the wax rises because of its lower density than its surroundings, so magma may rise from the mantle to be intruded into the crust, or it may erupt onto its surface to form lava flows;
- Wax reaching the surface is very mobile and spreads out into a sheet, simulating the widespread "plateau lavas", like the Antrim Plateau, where huge volumes of lava erupted from fissures rather than from central volcanoes;
- "Feeder pipes" and fissures occur naturally too, and effectively insulate the rising magma

Wax volcano – kimberlite intrusion



ELI around the world

Earth Learning Idea around the world as on July 31st 2016

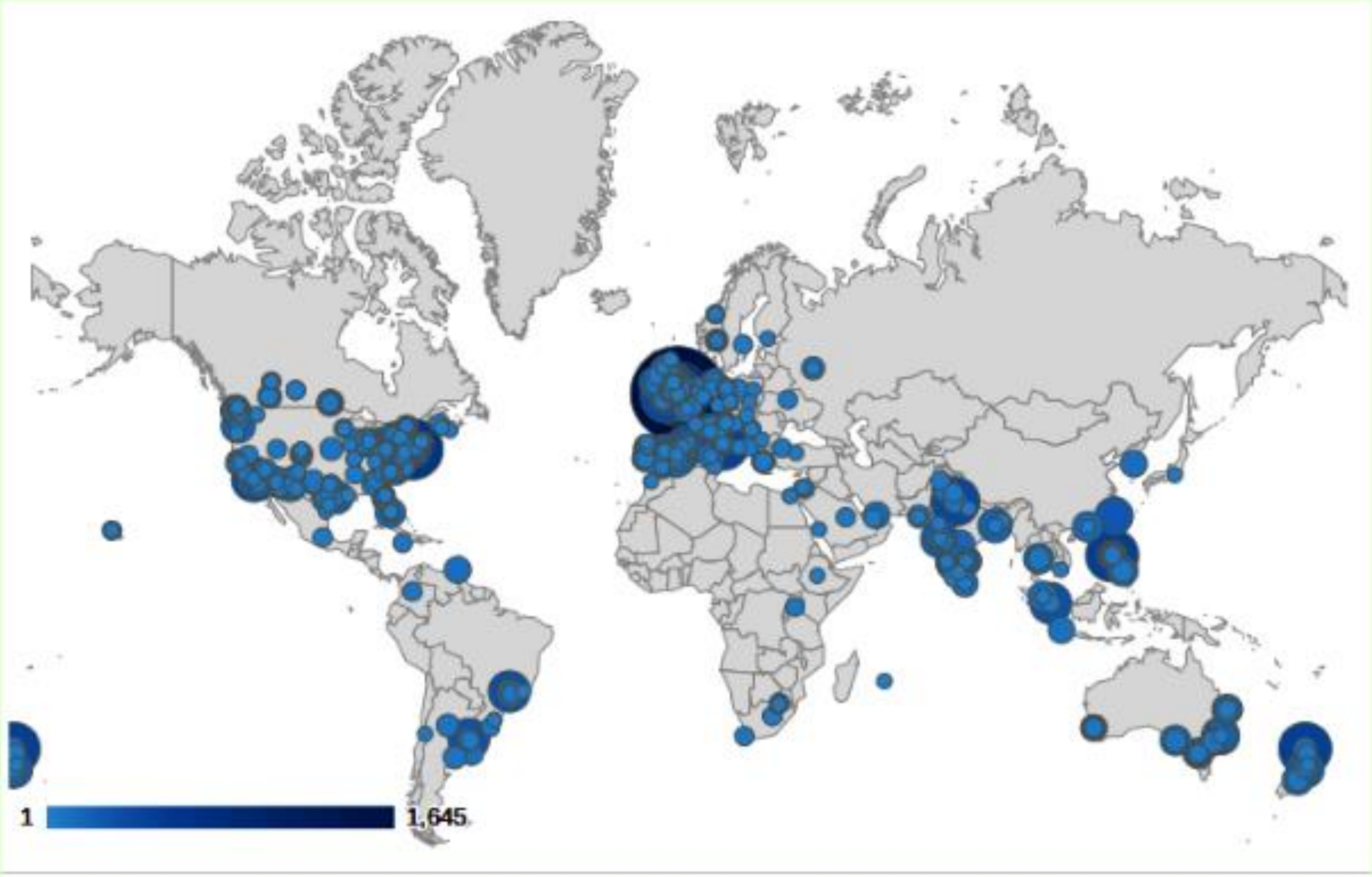
The map below shows how far **Earth learning idea blog** has spread across the world since we started on 6th May 2007.
There have been visits from **199** countries. The darker the colour, the more hits. We have not reached the countries coloured grey. Can you help?

Data provided by Google Analytics

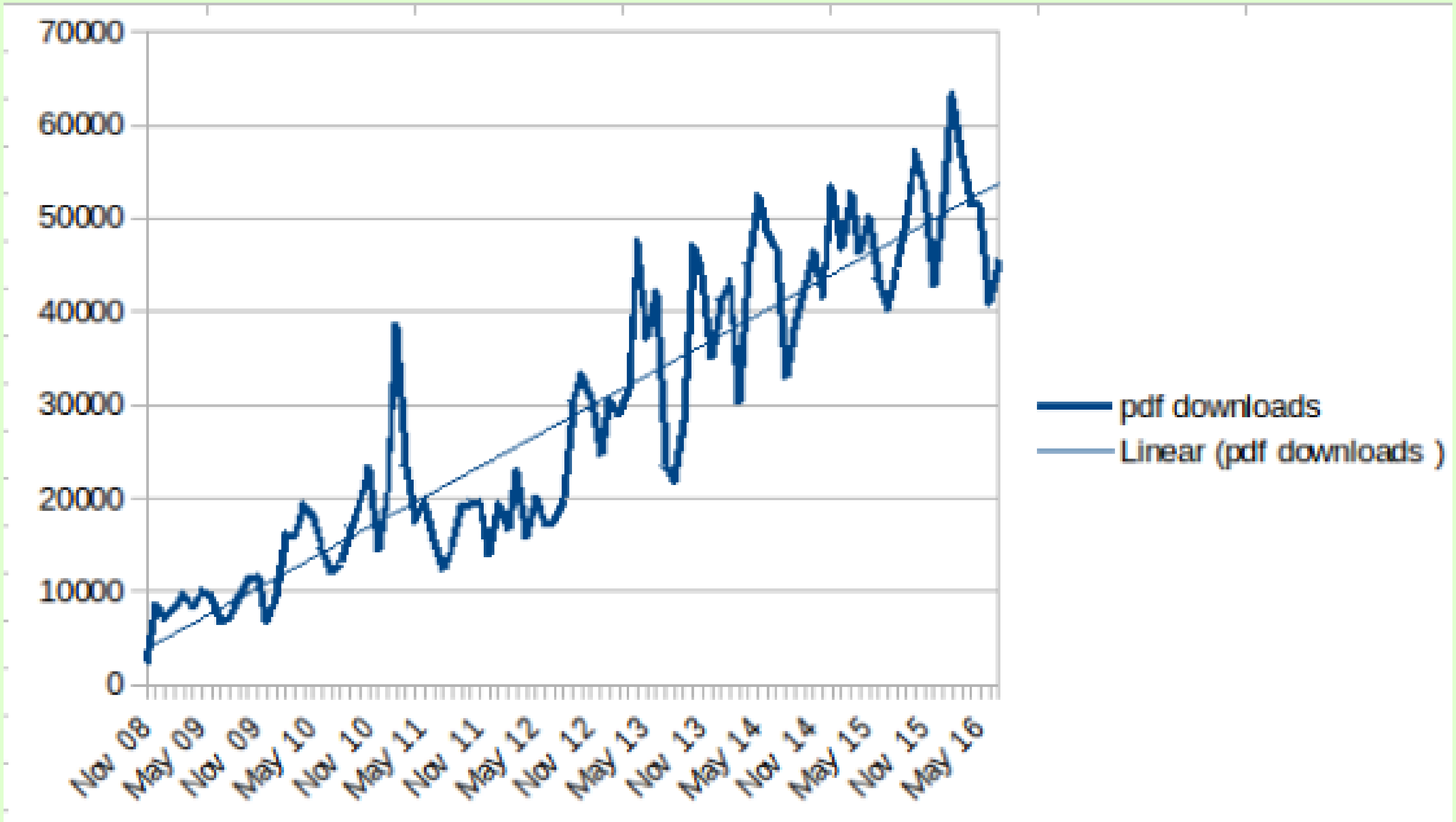
Our top ten countries:-

- United States
- United Kingdom
- India
- Spain
- Canada
- Australia
- Italy
- Philippines
- New Zealand
- Germany

The following map shows the **10,022 towns/cities** reached by **Earth learning idea blog** across the world

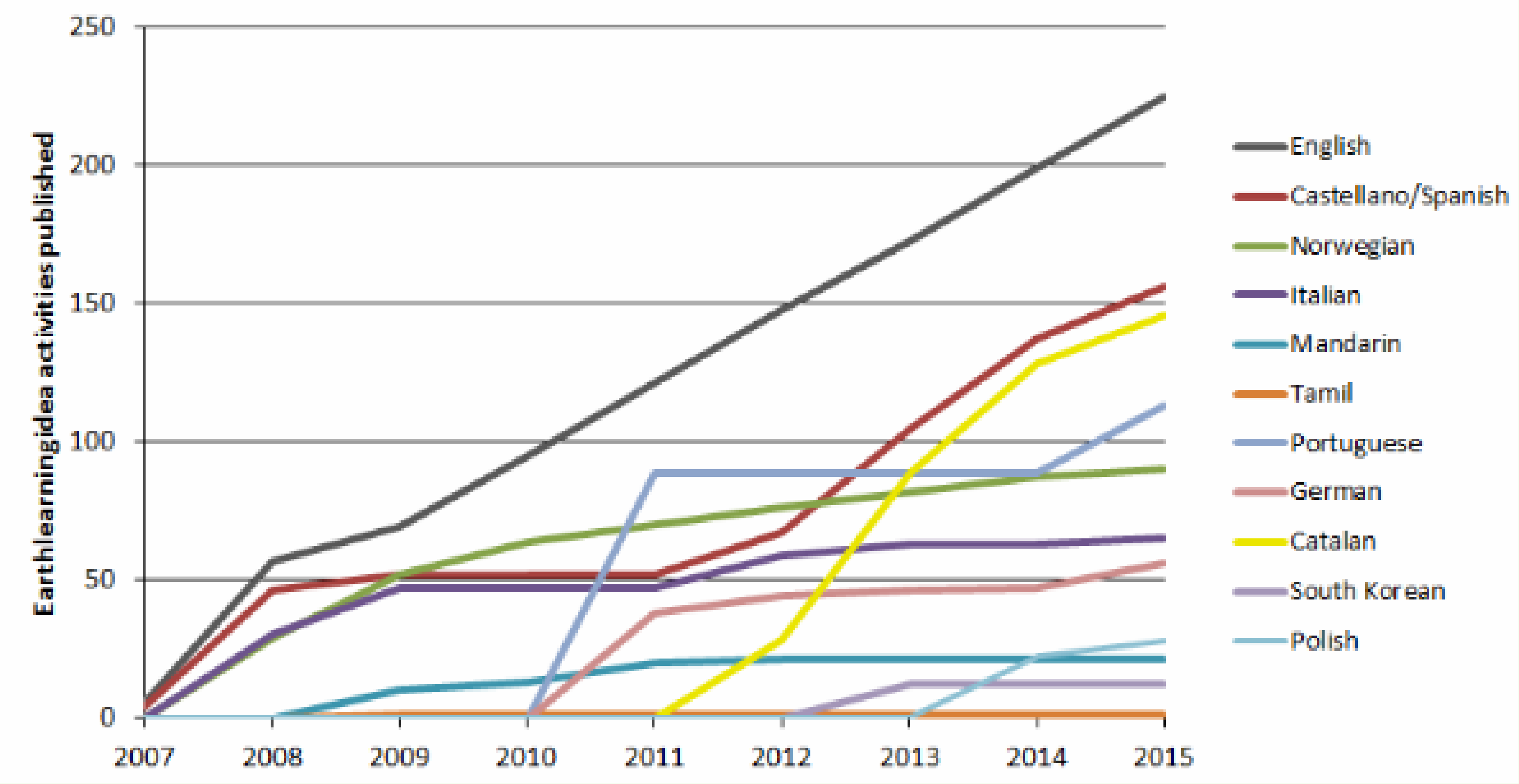


Earth Learning Idea activity downloads, November 2008 - July 2016 - total 2,681,866 *Data provided by Webalizer*



(Data only available from November 2008, when Earth Learning Idea was moved to a formal web host)

Total numbers of Earth Learning Ideas, September '07 - December '15



688 translations from English by the end of 2015

- A failed bid for International Year of Planet Earth (IYPE) funding
- Three Earth Science Education Unit (ESEU) facilitators decided to ‘go it alone’ on a voluntary basis
- The Earthlearningidea website was set up - aimed at publishing a new idea every week during IYPE – particularly for use in developing countries with little or no equipment
- By the end of IYPE (2008), 57 activities had been published (5 in the build up to IYPE, 52 in the year)
- Later expanded to include activities using ‘normal’ school lab equipment and more abstract ideas together with ‘Early years’ activities
- By mid-August 2016:
  - 242 activities published in English, plus 50 activities in the pipeline
  - > 700 translations from English, in 11 languages
  - More than 2.5 million pdf downloads, averaging more than 50,000 per month
  - Search engine will find words in any language

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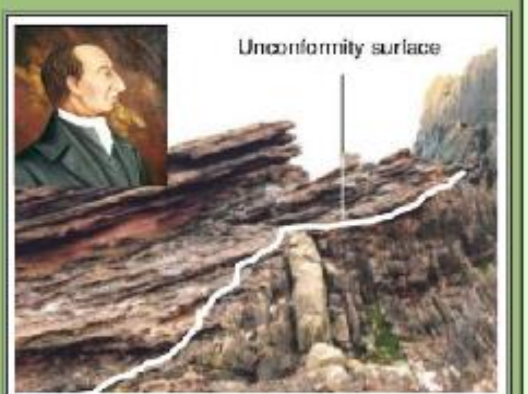

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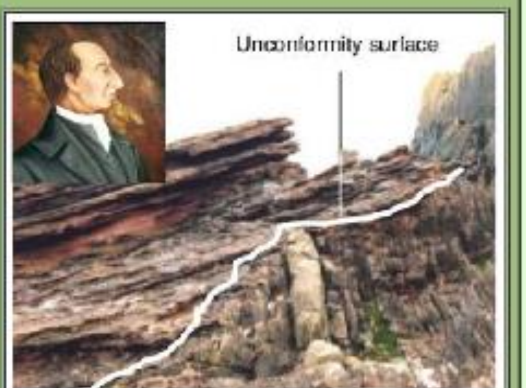

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Tsunami simulation hands-on - Chris King

Brickquake

Earthquake prediction - when will the earthquake strike?
Modelling the build-up of stress and sudden release in the Earth that creates earthquakes

Ask pupils why they think many people can be killed when an earthquake strikes. (*Answers will include falling masonry and glass, collapsing highways, landslides, associated fires etc, but should also include the difficulty of knowing exactly when and where an earthquake will strike. If we could predict when earthquakes would strike, people could be told to move out until the danger was over*).
Most earthquakes are caused by sudden movement along natural fractures in the rocks, called faults.
Explain that we are going to model how forces acting in the Earth can build up stresses, which are suddenly released when rocks fail (fracture).
Set up three or four house bricks, or similar heavy objects as in the photograph. Attach a length of elastic rope, or a coiled spring to the middle brick with string or wire. Pull steadily on the elastic or spring until the top bricks suddenly slide over the lower ones. This represents the point at which rocks below ground fracture and move, resulting in an earthquake on the surface above them. (It will probably be necessary to hold down the front brick on the table to prevent it from sliding).
Repeat the activity several times, trying to increase the tension on the spring at the same rate as before. Each time, ask the pupils to observe how long it takes before the movement occurs and by how much the bricks move. (*The results are seldom consistent, demonstrating that there is considerable variation in the timing and amount of movement along real fault planes in the Earth – viz. great unpredictability*).

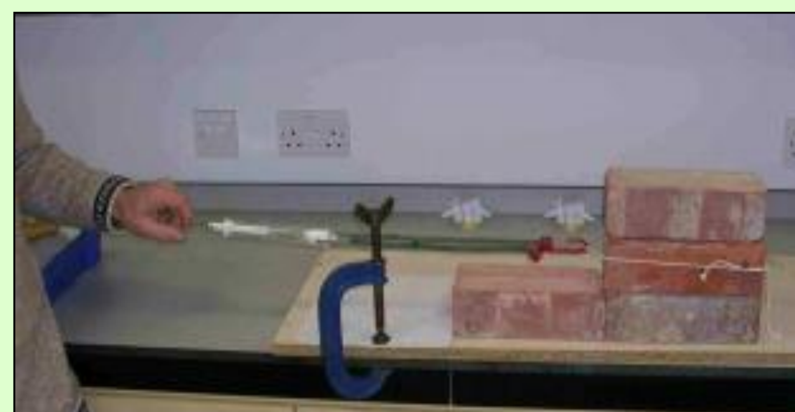
The activity may be extended by varying the friction between the bricks. This may be done by adding more bricks, sprinkling sand between the layers of bricks, or even trying to lubricate the surface between them.

(Warn pupils to beware bricks falling off the bench).

A shallow dish of water placed near the bricks may show a shimmer of ripples over the surface when the bricks move. This is analogous to the damaging surface waves created when an earthquake strikes.

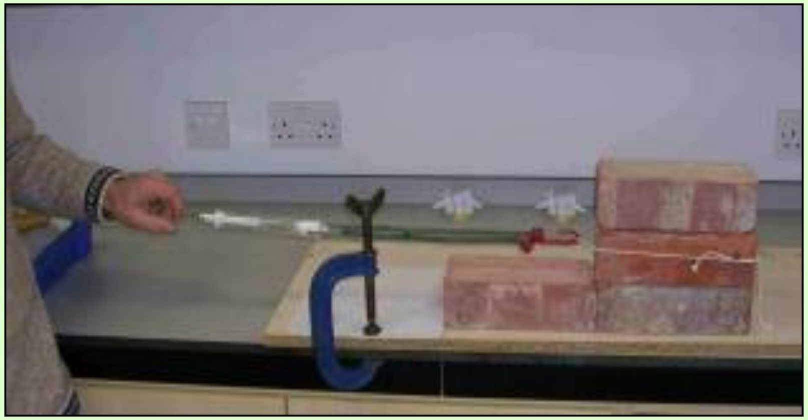
The brick 'earthquake' in action – a) using another pupil to restrain the front brick from moving

The brick 'earthquake' in action – b) Using a Newton meter to quantify the forces involved. The front brick is stopped from sliding by a board, held to the bench by a cramp.
(*Photos: P. Kennett*)



Brickquake

Distance moved Meters (m)	Force Newtons (N)	Relative Energy transferred Joules (J)
0.02	15	0.30
0.075	45	3.375
0.035	35	1.225
0.04	25	1.00



Tsunami

Tsunami
What controls the speed of a tsunami wave?

Remind pupils of the disastrous tsunami wave of 26th December 2004 in the Indian Ocean. Some pupils may actually have experienced a tsunami, or may have been affected by experiences of relatives.
Ask pupils to say what things might affect the speed at which a tsunami travels. (*The main factor is the depth of water across which the wave travels*).
Set up a long tank made of any suitable material, preferably transparent. (The 1m length of house guttering shown in the background of the picture will work, although it is really rather too shallow). Add, say, 10 mm of water to the tank and colour it with food dye or ink. Raise one end of the tank onto a block about 50mm high and let the water settle down. Then drop the end of the tank sharply off the block onto the bench. Time how long it takes for the wave to reach the other end of the tank. Unless the tank is very long, a more accurate result may be obtained by timing about 5 reflections of the wave off the ends of the tank, and dividing by the number of reflections. Several sets of readings should be taken and the averaged result calculated.
Ask the pupils whether the wave will travel faster or more slowly if the water is deeper. (*It travels faster*).
Double the depth of water (e.g. to 20mm) and repeat the activity as above.
Show the effects of a sloping beach by adding a 'beach' modelled in clay to one end of the tank.
Ask pupils to observe how the wave rapidly engulfs the 'beach', but slaps relatively harmlessly against the vertical wall at the other end of the tank. (It might not be harmless in real life though!)

Timing the flow of a tsunami in a plastic tank
(*Photo: P. Kennett*)

A tsunami strikes - the 2004 tsunami strikes the coast of Thailand at Ao Nang. Photo by David Rydevi: skylark292@gmail.com *This image has been (or is hereby) released into the public domain by its creator, David Rydevik. This applies worldwide.*

The back up
Title: Tsunami

Subtitle: What controls the speed of a tsunami wave?

Topic: Investigating the relationship between the depth of water in a tank and the velocity of a water wave generated by lifting and then dropping one end of the tank.

Age range of pupils: 10 – 18 years

Time needed to complete activity: 20 mins

Pupil learning outcomes: Pupils can:
- describe how waves are transmitted across water;
- explain that waves travel faster in deeper water than in shallow water;
- understand the role of friction in slowing the wave;
- explain the dangers of being on a beach when a tsunami strikes.

Context: The topic provides a graphic link between the theory of wave motion and a potentially lethal natural phenomenon. It could be taught in both science and geography lessons.

Following up the activity:
- Pupils could calculate the speed of the wave for various water depths and plot a graph of speed against water depth (*It is a non-linear relationship*).
- Pupils can model different coastal configurations in clay to investigate the impact of an arriving tsunami.
- Use a search engine, e.g. Google, to find many video clips and images of the Boxing Day tsunami of 2004. A websearch can be carried out for other tsunami simulations; also for proposals to establish tsunami-warning systems.

Underlying principles:
- Tsunamis are triggered by major events such as earthquakes, submarine landslides or volcanic explosions.

Tsunami through the window

A tsunami through the window - what would you see, what would you feel?

Asking pupils to picture for themselves what a tsunami through the window might look like

Look through the window, or through the doorway, with your class. Ask them to discuss in small groups what they might see and feel if a major tsunami wave hit the view they can see outside. Then ask them what they would do and why. Use the photo below to trigger their thinking.

You could ask questions like these:
- If a big tsunami wave came from the left, what would it look like?
- How high up the buildings/trees you can see would the wave come?
- How fast would it be flowing?
- What colour would it be?
- Would it be carrying anything? What?
- Could you get out of the way?
- How would you feel as the wave came?
- What would you do?
- What would you get your friends to do?
- What might have caused the wave?
- Can we find out when waves like these are coming?

Explain that tsunamis only badly affect low lying coastal areas, so if they are in a higher or inland area, they are quite safe!

A tsunami strikes - the 2004 tsunami strikes the coast of Thailand at Ao Nang. Photo by David Rydevik: skylark292@gmail.com

The back up

Title: A tsunami through the window - what would you see; what would you feel?

Subtitle: Asking pupils to picture for themselves what a tsunami through the window might look like

Topic: A 'thought experiment' imagining how a tsunami would affect the view through the window.

Age range of pupils: 8 – 18 years

Time needed to complete activity: 15 – 30 minutes

Pupil learning outcomes: Pupils can:
- describe a tsunami as a large wave or waves;
- explain how a tsunami might affect a built up area and its population;
- describe how they might be able to save themselves and others if a tsunami struck the area where they were;
- explain the causes of tsunamis.

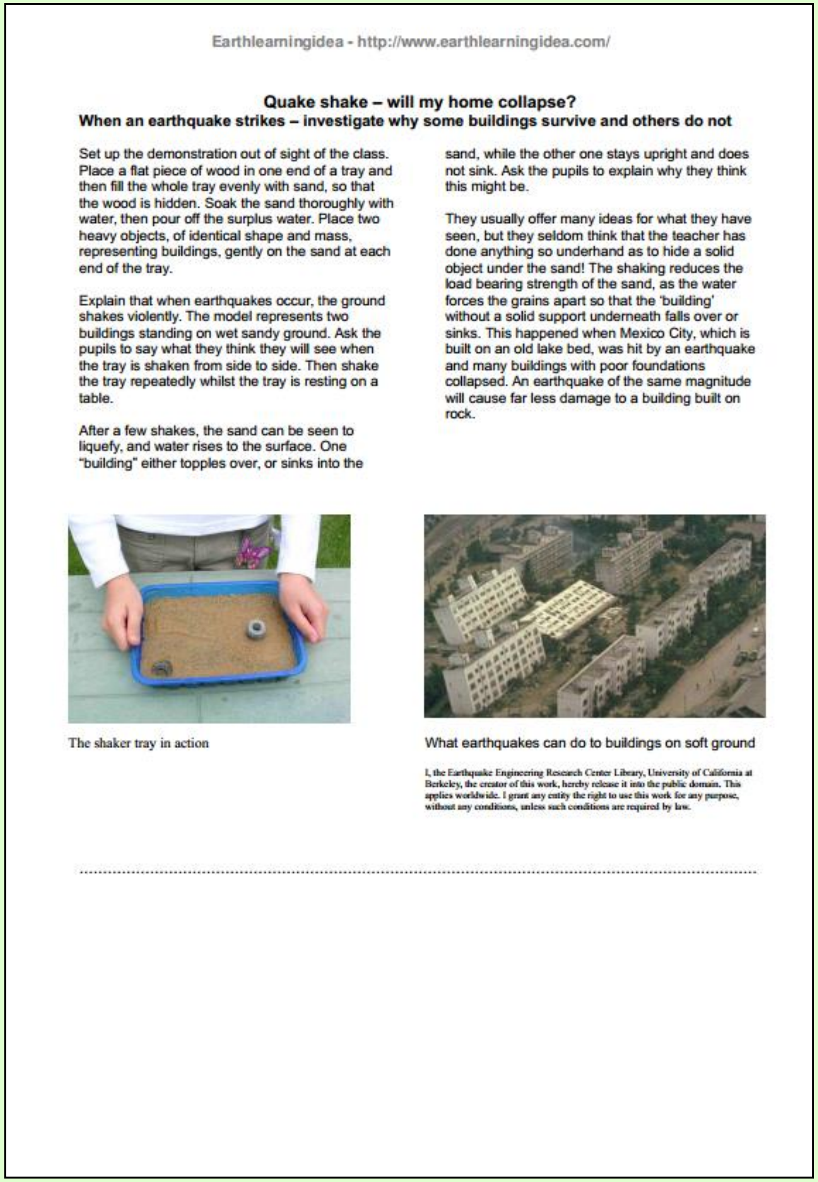
Context:
The class is asked a series of questions about what a tsunami is like, as they look through the window or doorway (having looked at a photo or photos first). They are asked discuss the answers in groups to provide a better 'feel' for what it might actually be like to be there. Note: the wave doesn't necessarily have to come 'from the left' (it could be from the right, or straight ahead) but it is useful if the pupils all use the same scenario. Some possible responses, for discussion, are given below.

If a big tsunami wave came from the left, what would it look like?	If you saw it across the beach, it would be a white breaking wave a couple of metres or so high. By the time it reaches the buildings, it will probably be less than a metre high – but it moves forward inexorably, sweeping away things in its path. It looks spectacular in this photo because it has probably hit a barrier. Although tsunami waves of 30m high have been recorded, they are very unusual.

Tsunami through the window

- If a big tsunami wave came from the left, what would it look like?
- How high up the buildings/trees you can see would the wave come?
- How fast would it be flowing?
- What colour would it be?
- Would it be carrying anything? What?
- Could you get out of the way?
- How would you feel as the wave came?
- What would you do?
- What would you get your friends to do?
- What might have caused the wave?
- Can we find out when waves like these are coming?

Quake shake



Quake shake – will my home collapse?
When an earthquake strikes – investigate why some buildings survive and others do not

Set up the demonstration out of sight of the class. Place a flat piece of wood in one end of a tray and then fill the whole tray evenly with sand, so that the wood is hidden. Soak the sand thoroughly with water, then pour off the surplus water. Place two heavy objects, of identical shape and mass, representing buildings, gently on the sand at each end of the tray.

Explain that when earthquakes occur, the ground shakes violently. The model represents two buildings standing on wet sandy ground. Ask the pupils to say what they think they will see when the tray is shaken from side to side. Then shake the tray repeatedly whilst the tray is resting on a table.

After a few shakes, the sand can be seen to liquefy, and water rises to the surface. One "building" either topples over, or sinks into the sand, while the other one stays upright and does not sink. Ask the pupils to explain why they think this might be.

They usually offer many ideas for what they have seen, but they seldom think that the teacher has done anything so underhand as to hide a solid object under the sand! The shaking reduces the load bearing strength of the sand, as the water forces the grains apart so that the 'building' without a solid support underneath falls over or sinks. This happened when Mexico City, which is built on an old lake bed, was hit by an earthquake and many buildings with poor foundations collapsed. An earthquake of the same magnitude will cause far less damage to a building built on rock.

The shaker tray in action

What earthquakes can do to buildings on soft ground

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What earthquakes can do to buildings on soft ground

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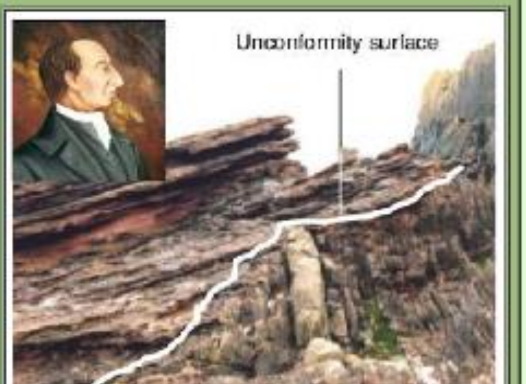
Popular activity in July 2016:-
James Hutton – or 'Mr. Rock Cycle'?
Thinking towards the rock cycle, the Hutton way



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NEW ELI

Questions for any rock face 12: potential of the quarry or cutting
What questions about the potential of the site might be asked at any rock exposure?

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ELI in the world

Activities related to the New ELI:-

- Quarry through the window; what would you see, what would you not see?
- Roadstone - which rock?

GIFT Workshop, Cape Town
Sat/Sun 27/28th August 2016

Tsunami simulation hands-on - Chris King