

Fierce Volcanoes and Extreme Earthquakes

Learning with Lapbooks



Fierce Volcanoes and Extreme Earthquakes

By Hanlie Steynberg



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Introduction

This lapbook project pack has been designed to introduce earthquakes and volcanoes to learners from age 6 to 11. With lapbooking, the content is presented in such a way that the child learns a new concept and then does a hands-on, creative activity that enforces the knowledge that has been learnt. When the result is shown to a friend, sibling or parent, revision takes place, and the knowledge is reinforced.

Using lapbooks, the knowledge retention is unparalleled! The child uses both sides of his/her brain to prepare the booklet, therefore learning takes place on a much higher level than textbook learning. Reluctant writers are encouraged to take part in more writing activities than usual, building their writing skills and gaining confidence. Creative learners bloom with all the decorating and construction taking place.

How to use this lapbook pack:

Using books from the library, your curriculum, or even encyclopaedias (see recommended reading), read the parts that cover the topic you are learning about, e.g. 'Layers of the earth'. To summarize, read the part covering the topic from this book. Complete the activity and store the completed items in a zip lock bag. Once you are done with the whole theme, put your lapbook together as described on page 18. Do not feel pressured to complete all the activities and remember that you have the freedom to adjust them so that it will suit the learner. Do not be overly concerned about the neatness and perfection of the final lapbook, it is the process that is important. Remember: if learning takes place, the lapbook is successful!

Recommended Reading:

Volcanoes (Let's-Read-and-Find-Out Science 2) by Franklyn M. Branley
ISBN 9780064451895

Volcano & Earthquake (DK Eyewitness Books) by Susanna van Rose
ISBN 9780756637804

The Magic School Bus Blows Its Top, A Book About Volcanoes by Gail Herman
ISBN 9780590508353

The Best Book of Volcanoes by Simon Adams
ISBN 9780753460924

Recommended Videos to Watch on the Internet:

<http://www.neok12.com/Volcanoes.htm>

<http://dsc.discovery.com/videos/volcano-video/>

<http://www.nationalgeographic.com/forcesofnature/interactive/index.html>

1. Layers of the Earth: Pinhole Book

If you could slice through the earth, you would see different layers of matter making up the earth, almost like a boiled egg. The topmost covering is called the crust. It is a layer of rocks that is thicker under land than under the ocean. It is about 5 km deep at its thinnest, and about 70 km deep at its thickest.

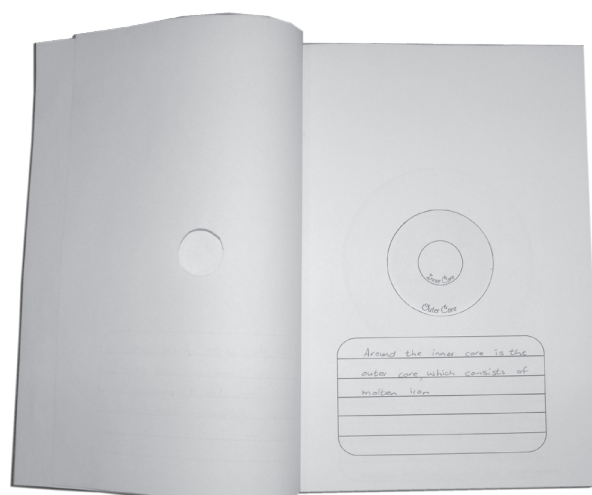
Below the crust is the mantle. It also consists of rock, but under pressure it moves, so that the upper part of the mantle is solid, but the deeper part is soft. The mantle is made up of silicon, oxygen, aluminium, iron and magnesium.

Next is the outer core, which consists of molten iron. At the centre of the earth is the inner core, which consists of iron as well. Its temperature ranges between 5 000 and 6 000 °C, and the pressure is 5 million times higher than the air pressure on the surface of the earth. The high pressure causes the core to be in solid form.

How to make the Pinhole Book:

Cut out the patterns on A1 to A5 on the outside lines, and cut out the circles in the middle of the pages as marked. Arrange the pages so that the page with the smallest hole is on the front, and with the holes going bigger and bigger to the back, and the picture of the earth and all the layers right at the back. Put all the pages together and staple on the left.

Describe the earth's inner core and what it consists of on the first page. Describe the earth's outer core and what it consists of on the following page. On the next page comes the description of the mantle, and on the last page the description of the crust. Colour the layers of the earth with different colours.



2. Tectonic Plates: Layered Map

The Earth's crust is made of rocky plates that fit together like a jigsaw puzzle, called tectonic plates. The plates are not joined together, but float on top of molten rock, also called molten magma. About 80 to 240 km below the earth's surface, rocks of the mantle begin to soften and melt. This creates a soft part under the hard crust of the earth, and the tectonic plates float on top of this molten rock. The hotter parts rise and because it moves away from the hot core, it cools down. When it cools down, it sinks again. This continuous motion is called a convection current. These currents cause the tectonic plates to shift, push apart and collide.

How to make the Layered Map

Cut out the template on A6. Use the template of the tectonic plates on A7 and trace it on a sheet of plastic with a permanent marker. Make sure you trace the border around the ring as well. Cut the plastic sheet out on the border. Describe what tectonic plates are in the space provided. Place the sheet of plastic as well as the booklet in the bag to use with activity 7.



3. Types of fault lines: Flap Book

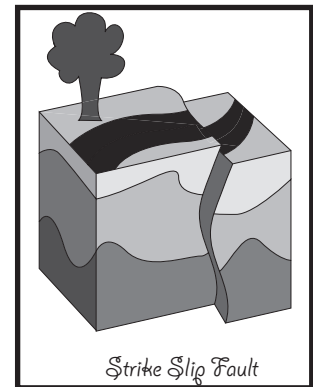
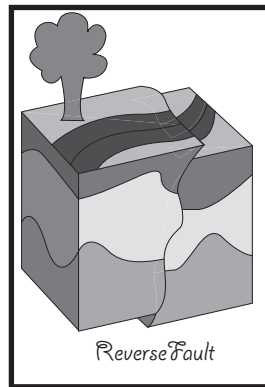
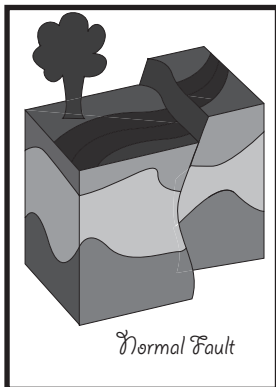
We have seen that the plates of the Earth's crust are constantly shifting, but the Earth's crust underneath our feet is not as solid as we might think. There are many cracks and areas where the crust is weaker. These cracks between shifting rocks are called fault lines. These fault lines also occur on the boundaries of the tectonic plates. You can see small faults in rock edges, riverbanks and where roads have been built, and large faults may extend hundreds of kilometres!

Regardless of the size of the fault, the type of fault that forms is determined by the way the rocks move along the fault.

When rocks pull apart, one side slips downward. This is called a normal fault.

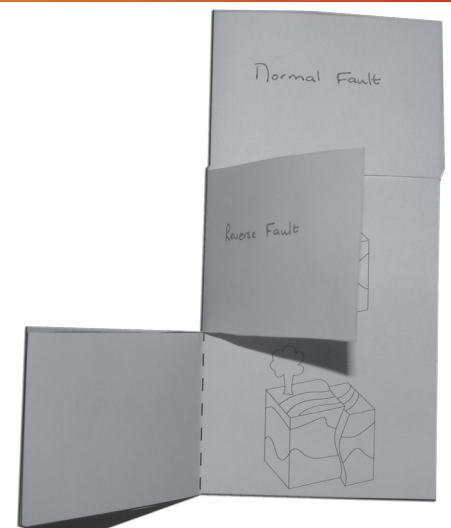
When rocks push together, one side shifts up over the other, creating a reverse fault.

When rocks slide past each other in opposite directions, a lateral or transform fault is created.



How to make the Flap Book

Cut out the templates on A8. Cut the booklet on the solid lines and fold on the dotted line. Write the name of the fault on the flap of each picture and colour the pictures. Put the title in your bag to paste onto your lapbook when you put it together.



4. What is a volcano: Shape Book

When the heat inside the earth causes the rocks to melt, a thick liquid called magma forms. This liquid is constantly moving in currents beneath the crust. Magma rises to the surface and pushes through weak spots in the crust, forming volcanoes. At this stage the magma is called lava.

Openings in a volcano lead below the earth's surface to very hot chambers, several miles underground where there are pools of magma, pieces of hot, solid rock, and hot gases. Shifts in the earth's surface can build up pressure beneath the volcano. The magma, which is lighter than the surrounding solid rock, is forced upward by the pressure and may ultimately break through, causing a volcanic eruption.

Gases and rock shoot up through the opening and spill over or fill the air with lava fragments. The lava may slowly cause a mountain to build up by flowing down the side of the volcano and cooling in layers.

How to make the Shape Book

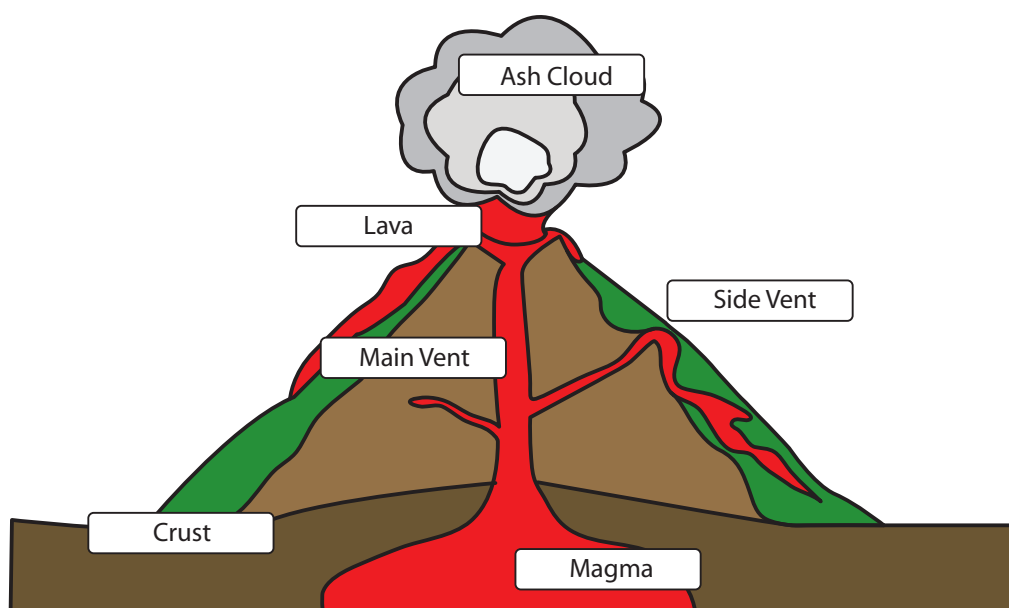
Cut out the volcano and smoke cloud templates on A9. Describe a volcano and how it forms on the rectangle below the smoke cloud. Slip the smoke cloud through the slit in the volcano. Pull the smoke cloud out to read your description.



5. Parts of a volcano: Shape Book

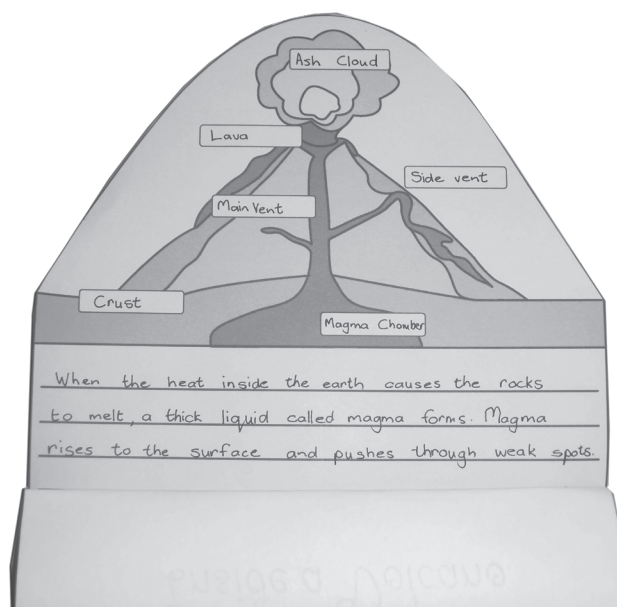
The parts of a volcano have different names used to identify and describe them. During an eruption magma rushes up to the surface in different ways. Some erupt through side vents or fissures, and some stay underground and form a bigger magma pool and when the magma then erupts, it is called the main vent.

Below is a diagram with the most important parts labelled.



How to make the Shape Book

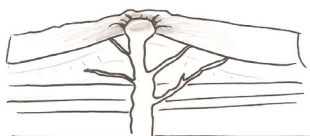
Cut out the patterns on A10 and A11. Staple the two pages together to form a book. Label the volcano as shown above. Describe the main parts of a volcano on the lines on the second page. Colour the volcano.



6. Volcano Classification: Accordion Book

Not all volcanoes are the same and scientists classify them in many ways, one way is according to their shape. There are 3 main shapes of volcanoes (scientists actually describe 10, but we will only look at the 3 main shapes)

Shield volcanoes are formed when lots of lava flows freely from a vent and spreads out widely. The lava slowly builds up a low, broad, shield-shaped mountain.



Composite volcanoes shoot out lava and rock fragments. The lava is very thick and the gas cannot escape from deep inside, so pressure builds up until an explosion occurs. The lava and rock is blasted high into the air and form a high, towering mountain.

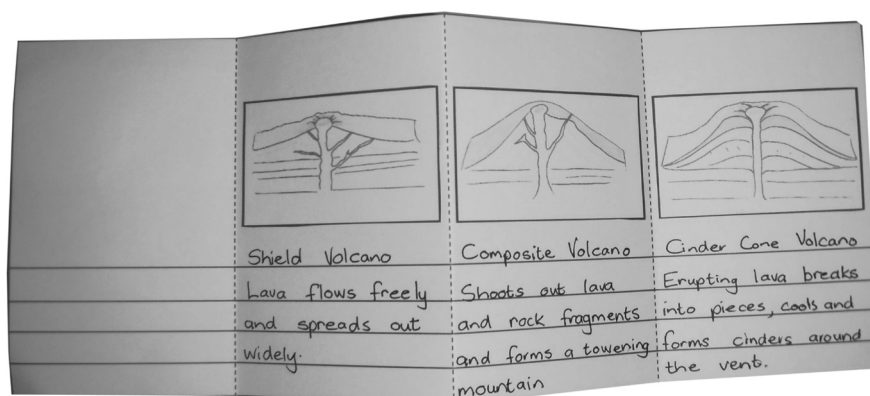


Cinder cone volcanoes are circular or oval cone-shaped mountains built from erupting lava that breaks into small pieces as it shoots into the air. As small pieces fall back to the ground, they cool and form cinders around the vent.



How to make the accordion book:

Cut out the pattern and pictures on A12 on the solid lines. Fold the pattern on the dotted lines to form an accordion book. Paste one volcano on every part and label. Describe each type of volcano on the lines provided. Paste the title on the front.



7. Famous Volcanoes: Layered Map

There are more than 500 active volcanoes on the Earth's surface. These are known to have erupted at least once in known history. Some of them are well known and famous!

1. Mount Vesuvius

Mount Vesuvius is a volcano in Italy, close to Naples. One of its biggest eruptions occurred in AD 79, completely destroying the ancient cities of Pompeii and Herculaneum. It is regarded as one of the most dangerous volcanoes in the world.

2. St Helens

Mount St Helens is an active volcano in Washington, United States. The first eruption recorded in history was in 1800, and the most devastating one occurred in 1980. It is still active today.

3. Iceland

Iceland is known as the land of fire and ice. On the surface it is icy cold most of the time, but underneath, volcanic fires rage. Icelanders have had to cope with dangerous eruptions, and in April and May 2010 a volcano that has been dormant for 200 years, erupted a few times from the Eyjafjallajökull glacier. The smoke that originated from the volcano caused air traffic all over Europe to be disrupted.

4. Mount Fuji

Mount Fuji is a famous cone-shaped volcano, and the highest mountain in Japan. It is regarded as active, but there is a low risk of eruption. The last recorded eruption was in 1707.

5. Mount Etna

Mount Etna is an active volcano on the east coast of Sicily. It is the highest volcano in Europe and has the longest history of eruptions that has been recorded.

Find another 3 famous volcanoes using an encyclopaedia, or the following websites:

<http://www.universetoday.com/31873/famous-volcanoes/>
<http://www.buzzle.com/articles/world-famous-volcanoes.html>

How to make the Layered Map:

Use an atlas and find the locations of five of the most famous volcanoes. On the booklet that you have made in activity 2, mark the locations with a coloured dot and number them. Write the name, location and number of the volcanoes under the 'Famous Volcanoes' heading. Put the book back into the bag to use with activity 8.



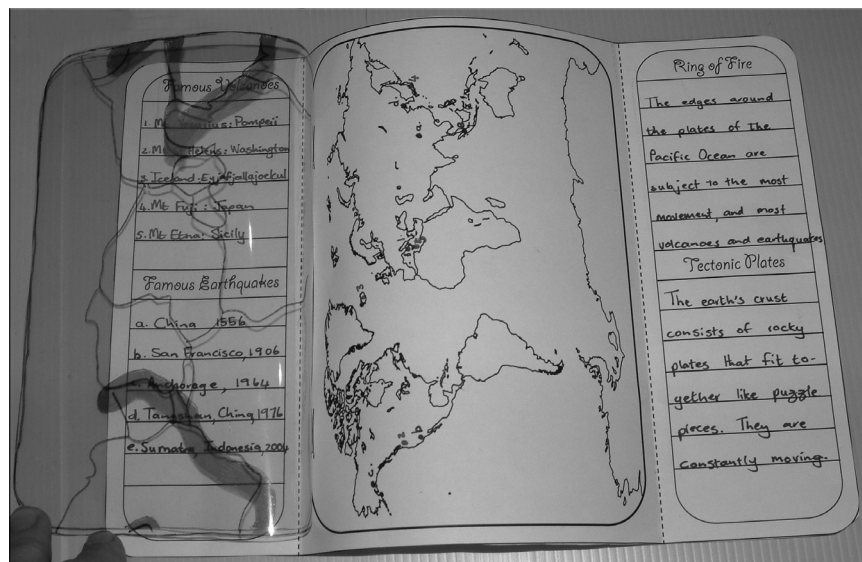
The teacher who
is indeed wise does not bid
you to enter the house of his
wisdom but rather leads you to the
threshold of your mind.
Kahlil Gibran

8. Pacific Ring of Fire: Layered Map

There is constant movement, pushing and pulling all along the edges of the tectonic plates that make up the Earth's crust. The edges around the plate of the Pacific Ocean are subject to the most movement of all the plates. In a 40 000 km horseshoe shape, we find 452 volcanoes, that is 75 % of the world's active and dormant volcanoes. About 90% of the world's earthquakes and 80% of the Earth's largest earthquakes occur along this area! We call this area the Pacific Ring of Fire, or simply the Ring of Fire.

How to make the Layered Map:

Use the template on A7 and use see-through plastic. Put the plastic on top of the template and trace the edges of the Pacific Ring of Fire on the plastic, preferably with a red permanent marker. Make sure you trace the border around the Ring as well. Use the book you used in activity 7 and describe what the Pacific Ring of Fire is in the space provided. Cut out the plastic on the border that you have traced. Staple this plastic sheet as well as the plastic sheet made in activity 2 on to the printed map in the book as in the example below. Put the book back into the bag to use with activity 12.



9. What is an Earthquake: Shape Book

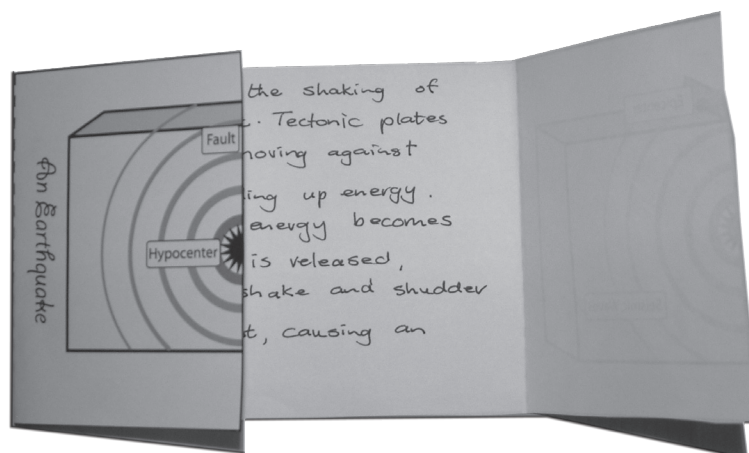
Earthquakes are the rolling, shaking, moving or shocking of the Earth's surface. The tectonic plates of the crust are constantly moving, causing rocks to bump, slide and even collide with each other. The movement of the two sides is not smooth and causes a gradual increase in elastic strain energy within the rocks along the fault.

Eventually the strain along the fault becomes too much and the rocks cannot bear the tension. The energy is then rapidly released with a sudden, explosive movement and travels through the crust in the form of vibrations called seismic waves. These waves cause the tremors, shaking and destruction we experience as earthquakes. When these seismic waves reach the surface of the crust they cause strong tremors that cause buildings and other structures to shake or collapse.

The location on a fault line where the movement first occurs is called the hypocentre of the earthquake, and the position on the ground directly above the hypocentre is called the epicentre of the earthquake. The strength of the waves decreases as you move away from the epicentre.

How to make the Shape Book:

Cut out the template on A13 on the solid lines. Fold the sides inwards on the dotted lines. Colour the picture on the outside of the shape book. Explain what an earthquake is and how it originates on the inside of the book.



10. Measuring Earthquakes: 2D Model

The main instrument used to measure earthquakes is a seismograph. It works like a basic pendulum system: it has a fairly heavy ball with a pen hanging on a string above a roll of paper that is constantly rolling forward. When the Earth shakes, the frame and paper moves with the Earth, and the pendulum ball resists movement because it is hanging free. The pen attached to the ball draws waves on the paper. The larger the waves, the stronger the earthquake.

A seismograph draws a seismogram and scientists can use it to measure direction, speed, magnitude as well as the type of fault of the earthquake.

The magnitude of an earthquake is defined on the Richter Scale. The Richter Magnitude is a mathematical technique used to determine the strength of an earthquake.

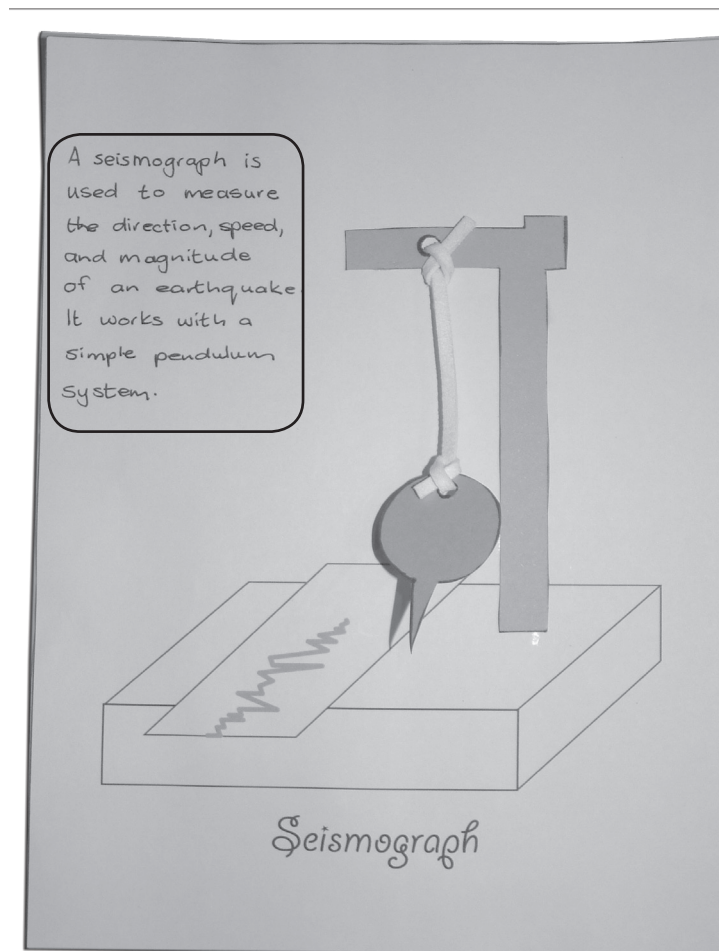
The Richter Scale is defined as follows*:

Description	Richter Size	Earthquake Effects	Average Annually
Micro	< 2.0	Microearthquakes, not felt.	About 8,000 per day
Very minor	2.0-2.9	Generally not felt, but recorded.	About 1,000 per day
Minor	3.0-3.9	Often felt, but rarely causes damage.	49,000 (estimated)
Light	4.0-4.9	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely.	6,200 (estimated)
Moderate	5.0-5.9	Can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.	800
Strong	6.0-6.9	Can be destructive in areas up to about 160 km across in populated areas.	120
Major	7.0-7.9	Can cause serious damage over larger areas.	18
Great	8.0 and bigger	Can cause serious damage in areas several hundred kilometers across.	1

* Excerpted from http://encyclopedia.kids.net.au/page/ri/Richter_scale

How to make the 2D Model:

Cut out the templates on A14. Use a piece of cord or wool. Tie the one end of the cord to the ball and the other end to the rod. Paste the rod with the ball onto the template you cut out so that the point of the ball hangs above the graph line. Describe how a seismograph works in the space provided.



A man should hear
a little music, read a little
poetry, and see a fine picture
every day of his life, in order that
worldly cares may not obliterate the
sense of the beautiful which God has
implanted in the human soul.

Johann Wolfgang von
Goethe

11. Staying Safe: Flag Book

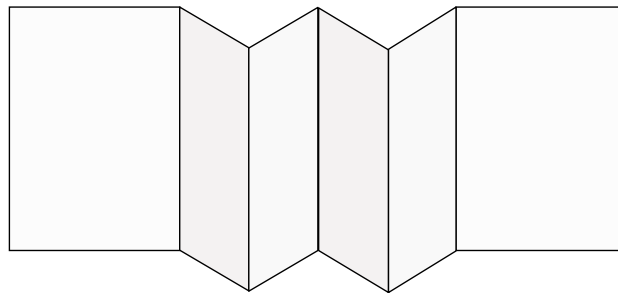
People living close to fault lines must always be prepared for an earthquake, as it can strike at any time. All loose bookshelves in a house should be fixed to the walls and heavy objects must be put close to or on the floor. If possible furniture should be fixed to the floor or walls. When a quake occurs, move away from windows and doors. If possible duck under a piece of furniture like a table, hold on tight and cover your head with your other arm. To remember it easily, think DROP, DUCK, COVER and HOLD ON.

Never use an elevator during or after an earthquake. If you are inside, DO NOT try to go outside. It is MUCH safer staying inside. Try to move away from loose furniture that can fall over or hurt you. If you are outside, move away from buildings, streetlights and overhead wires. If you are in a vehicle, drive away slowly from buildings and bridges and stay inside the vehicle.

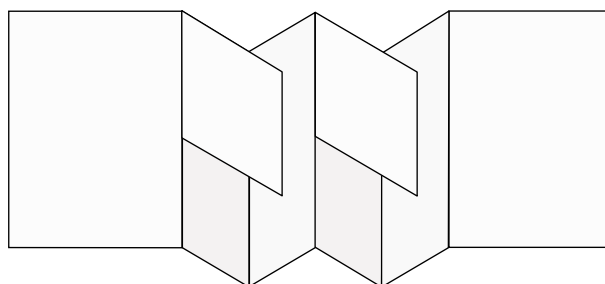
The best emergency plan for an earthquake is to have a plan. Plan an escape route from your house and have extra food and water for a couple of days. You have to keep a portable radio and flashlight with extra batteries close at hand, as well as a first aid kit.

How to make the Flag Book:

Cut out the patterns on A15 and A16. Fold the big rectangle on the dotted lines like an accordion.

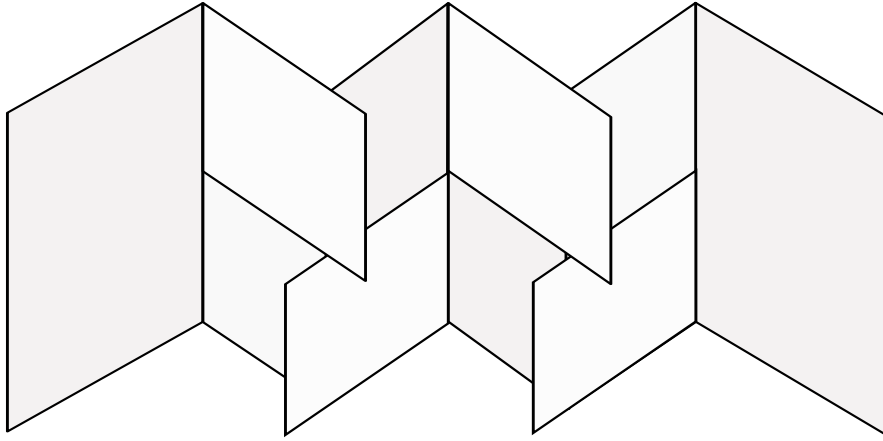


Paste two squares on the folded parts of the booklet. Refer to the pictures below. The squares must be aligned with the top of the rectangle and their left sides must be on a fold line.



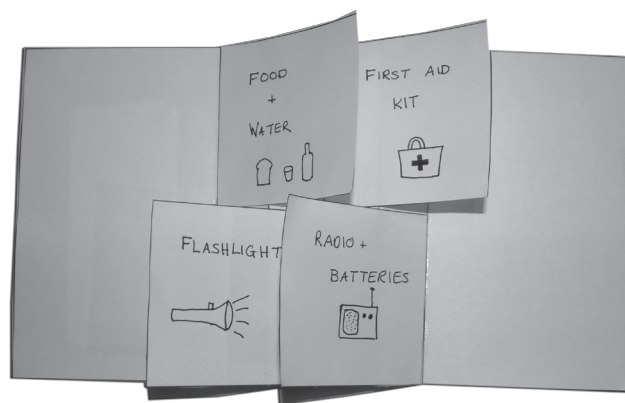
How to make the Flag Book (Continued)

Paste the other two squares on the other folded parts of the booklet. Refer to the pictures below. The squares must be aligned with the bottom of the rectangle and their right sides must be on a fold line.



To close the book, move the outside covers towards the inside and close like a normal book.

Create a list of supplies you need to keep at hand in case an earthquake happens. Write one item on each flag and use pictures from a magazine to paste on each flag as an example, or draw the items on each flag.



12. Famous Earthquakes: Layered Map

1. China, 1556

The world's deadliest earthquake occurred in central China in 1556. People lived in caves carved from soft rock and the caves collapsed during the earthquake and an estimated 830 000 people were killed.

2. San Francisco, 1906

In 1906 there was big earthquake, but what caused the most deaths and damage was a fire that raged for three days after the earthquake.

3. Alaska, 1964

An earthquake that measured 8.4 on the Richter Scale hit Anchorage, Alaska as well as Kodiak Island in 1964. It caused tsunamis, fissures and destroyed many buildings and oil storage tanks. An unbelievable 131 people died!

4. Tangshan, China, 1976

A series of earthquakes hit China on 28 to 29 July, 1976, ranging between 7.1 and 8.2 on the Richter Scale. An estimated 242 000 people died.

5. Mexico City, Mexico, 1985

On September 19, 1985 an earthquake that measured 8.1 on the Richter scale hit Mexico City with its 18 million residents. Two days later, an aftershock measuring 7.6 on the Richter Scale, struck. More than 10 000 people died.

6. Sumatra, Indonesia, 2004

On 26 December, 2004 an earthquake of an estimated 9.1 on the Richter scale, hit Sumatra, Indonesia. The hypocenter of the earthquake was deep under the surface at 18 miles under the ocean. The earthquake did not cause much damage, but a huge tsunami resulted from the earthquake. The tsunami reached parts of India, Indonesia, Thailand, and Sri Lanka. It has even reached South Africa to the east of the epicenter and Mexico to the west. Between 175 000 and 250 000 people died in the Tsunami, making it the largest natural disaster of the twenty-first century.

How to make the Layered Map:

Use the information on page 19 and find the locations of five of the mentioned earthquakes using an atlas and mark them with a coloured star on the map made in activity 8. Label them with letters, such as a, b, c and write a description of the earthquake that occurred there on the space provided.



How to complete your lapbook:

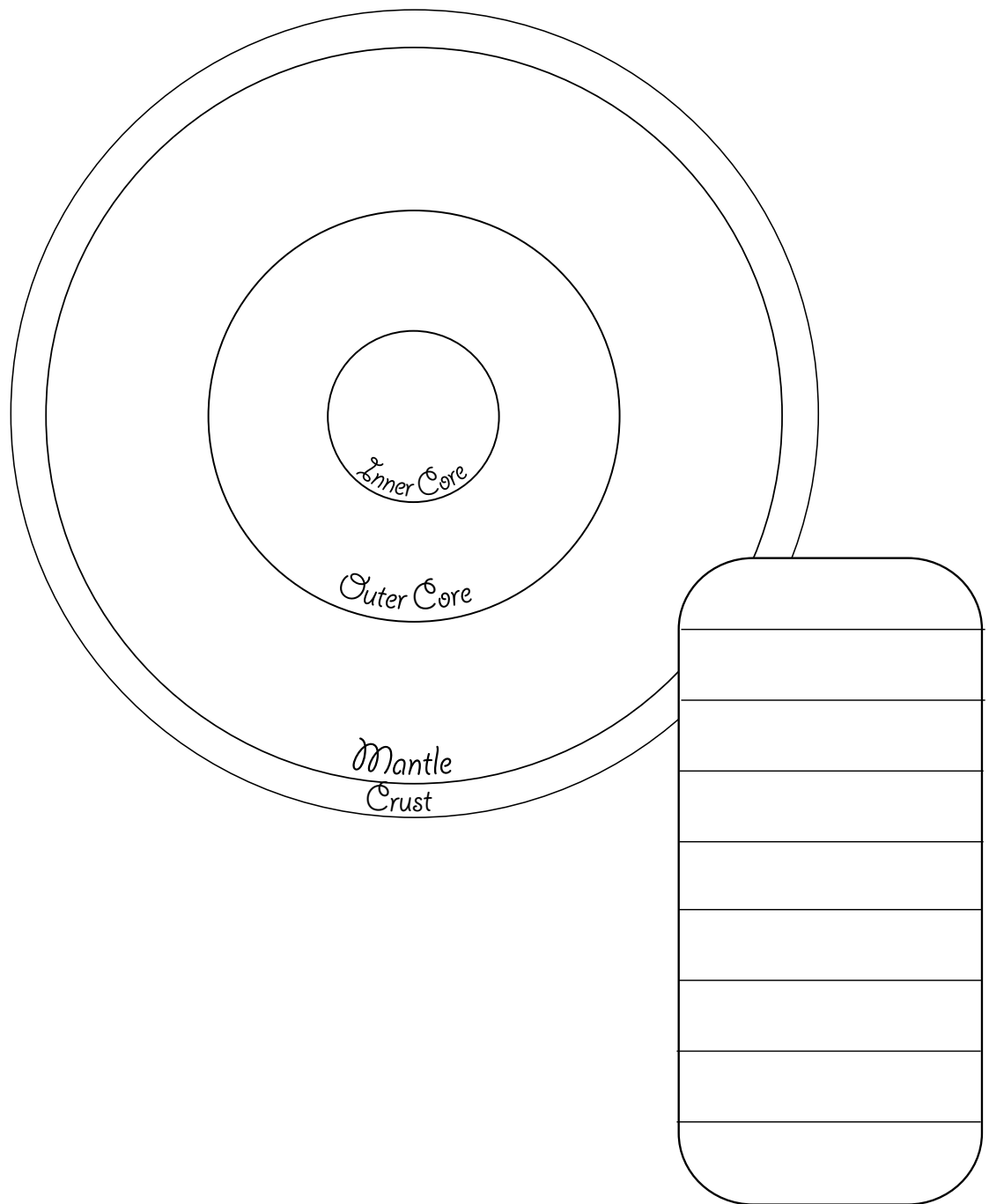
Fold the file folder with a shutter fold. Add extensions if necessary. See A17 for instructions. Decide where you want to paste your minibooks, and when you are satisfied, paste them down. Decorate the lapbook with any of the following:

- Stickers
- Pictures
- Photos
- Scrapbook decorations.

Use a stencil and write 'Earthquakes and Volcanoes' on the front cover, as well as your name. Decorate the front of your lapbook any way you wish. Be as creative as you can, and enjoy!!

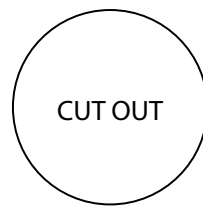
Congratulations! Your lapbook is completed!

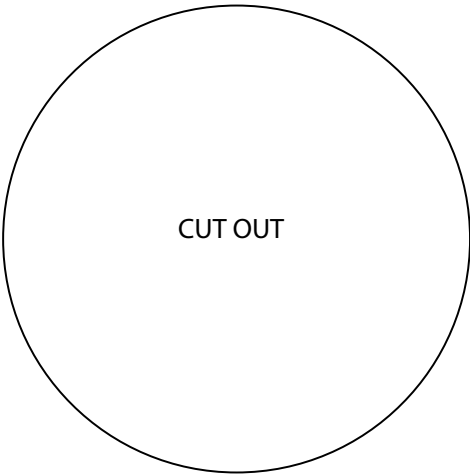
Put your lapbook where you can reach it easily, and admire your work as often as you can.

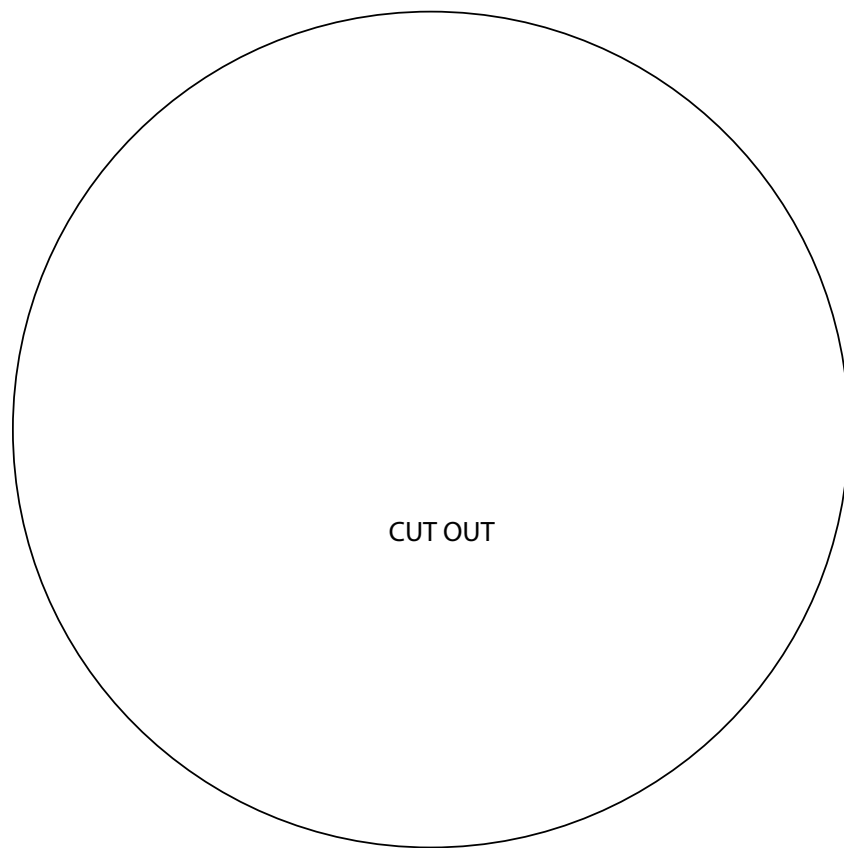


Layers of the Earth



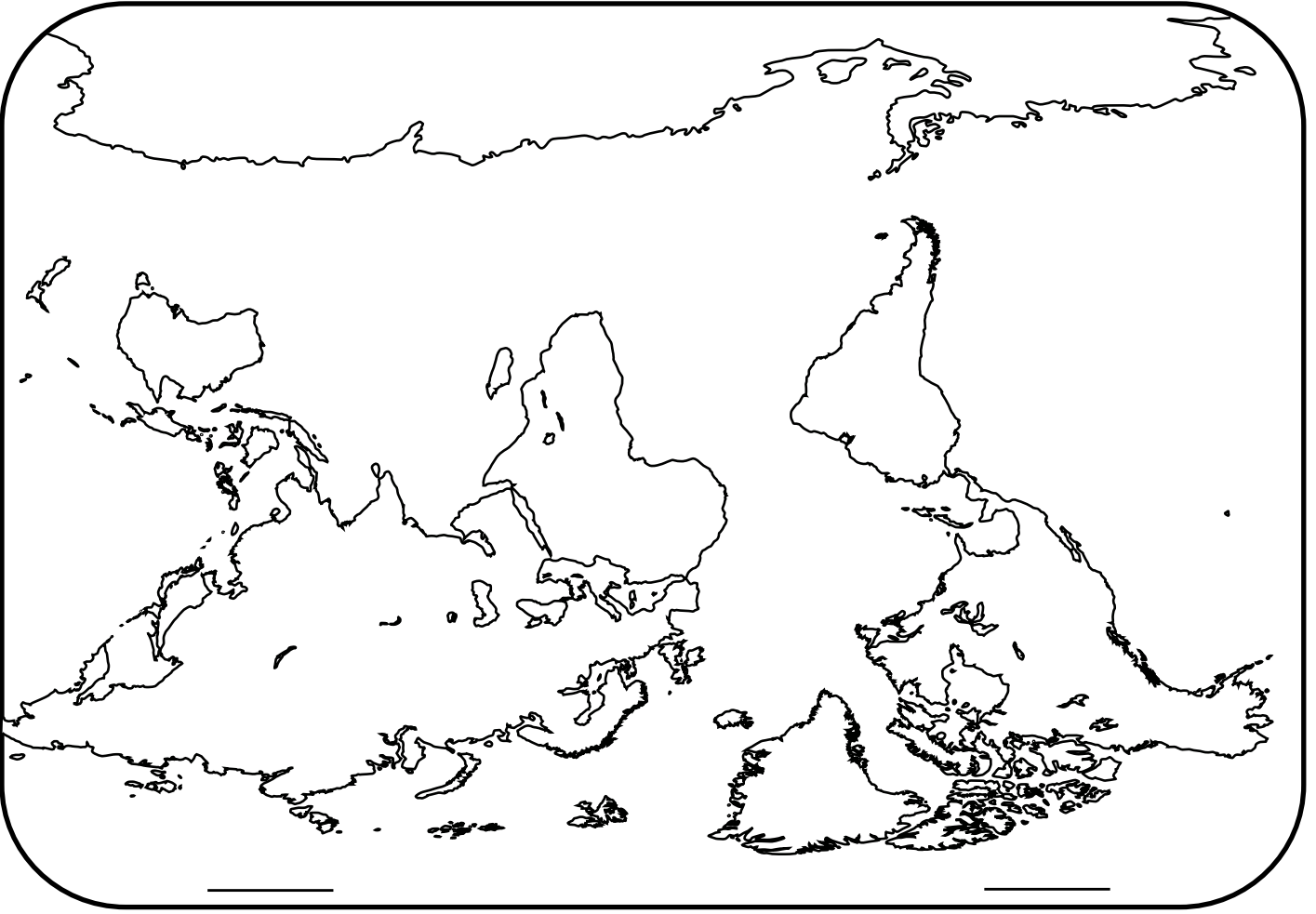






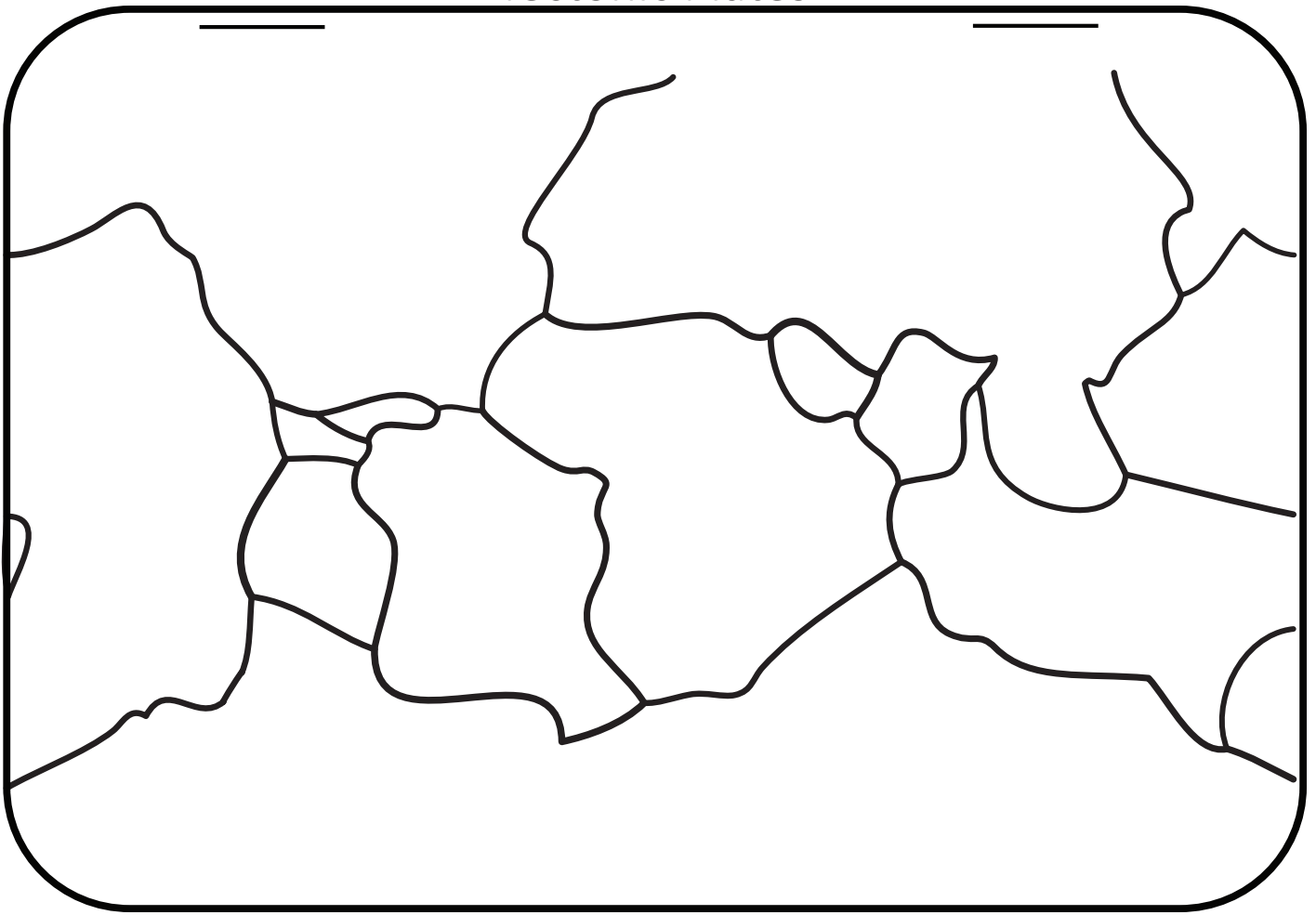
Ring of Fire

Tectonic Plates

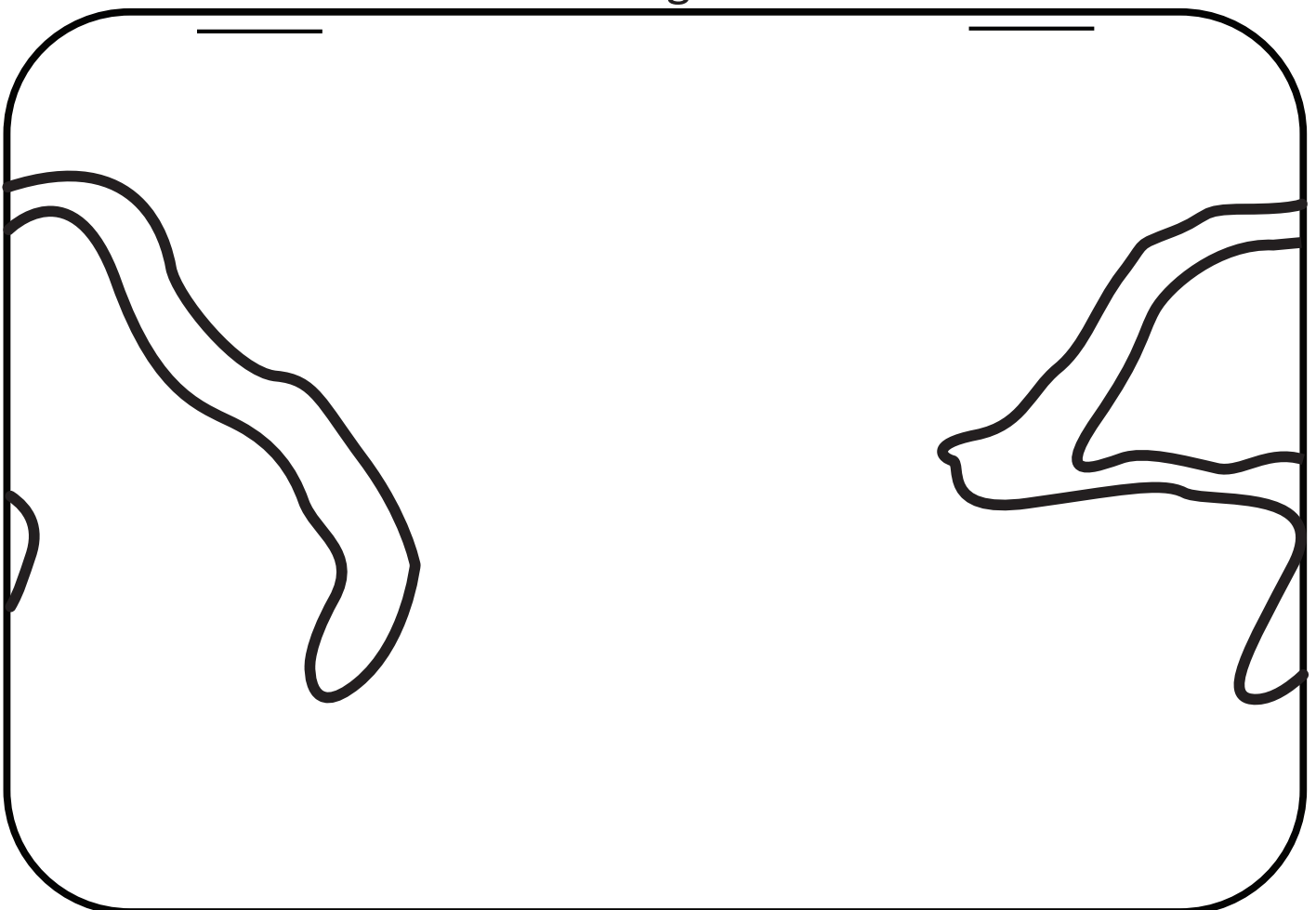


Famous Volcanoes

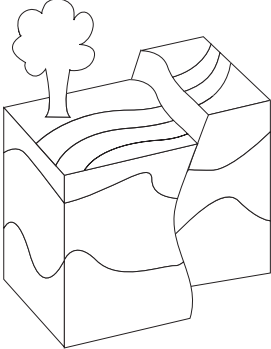
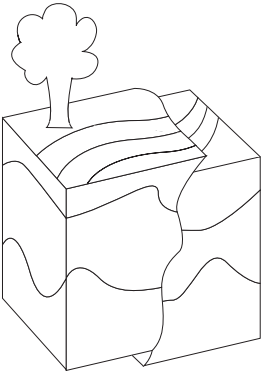
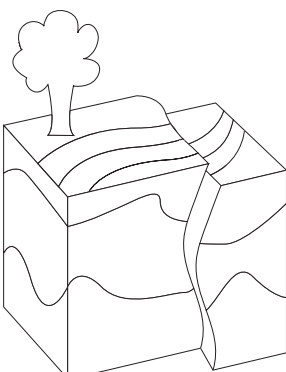
Famous Earthquakes

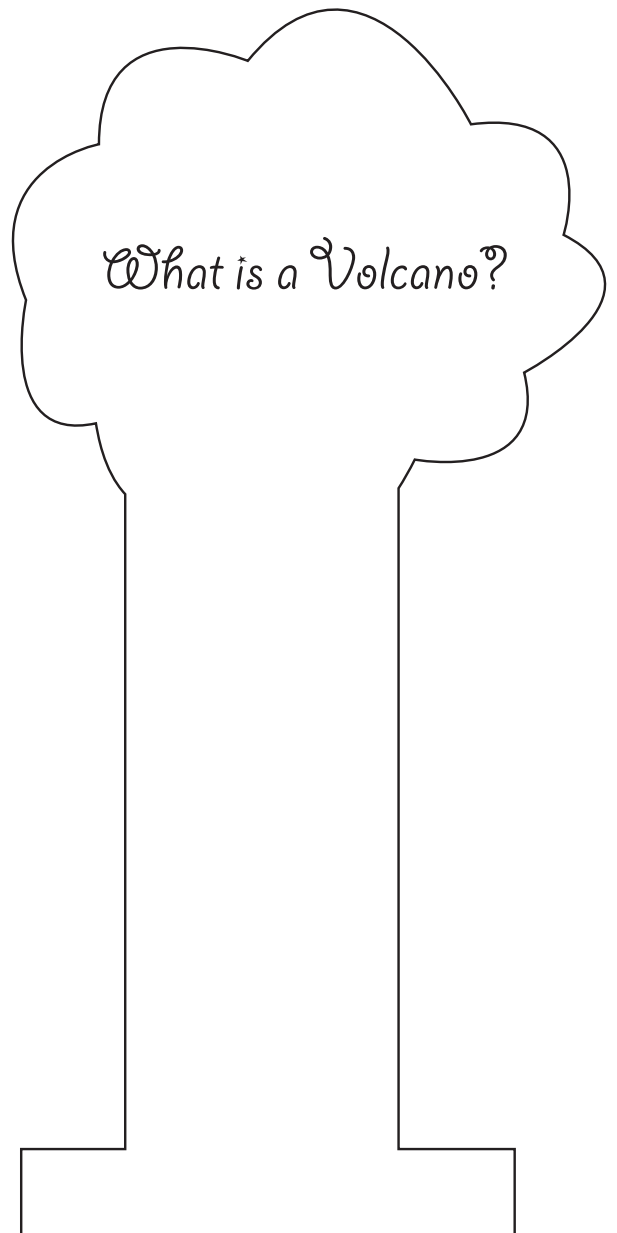
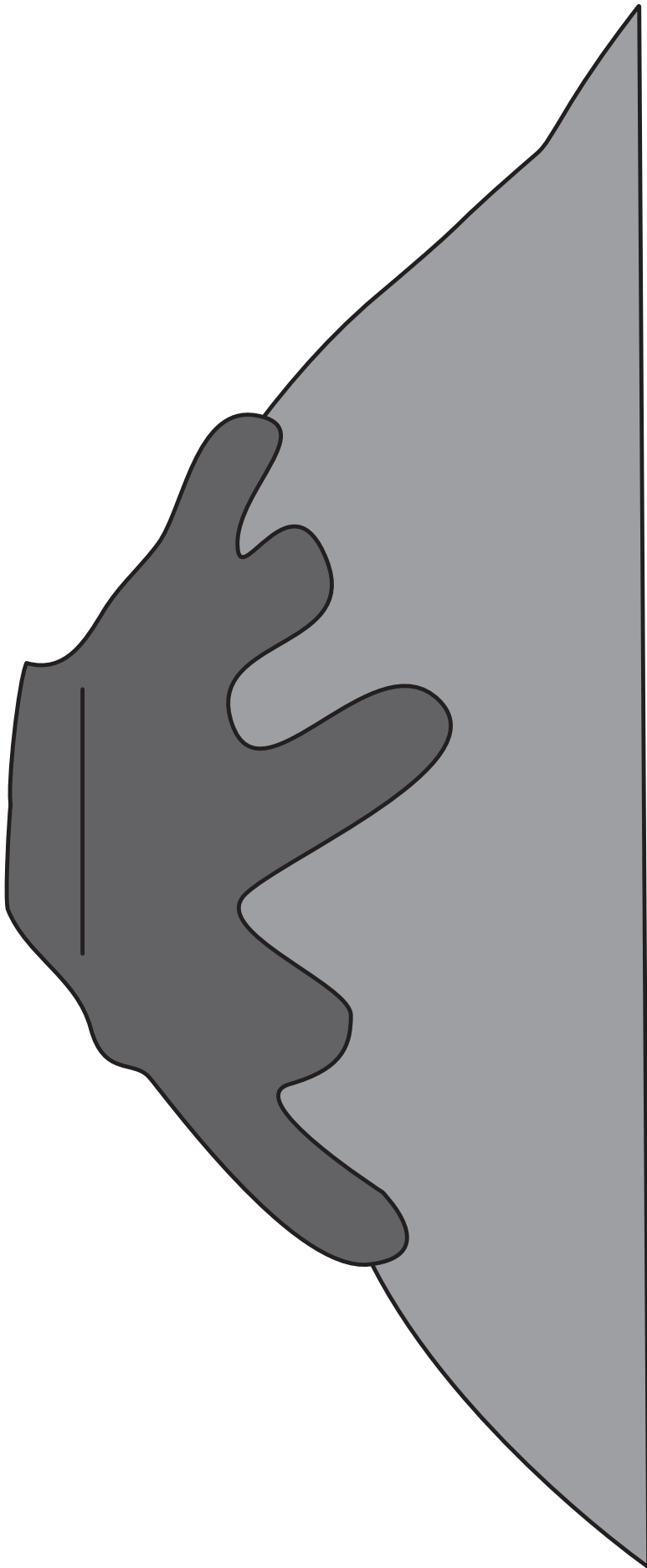


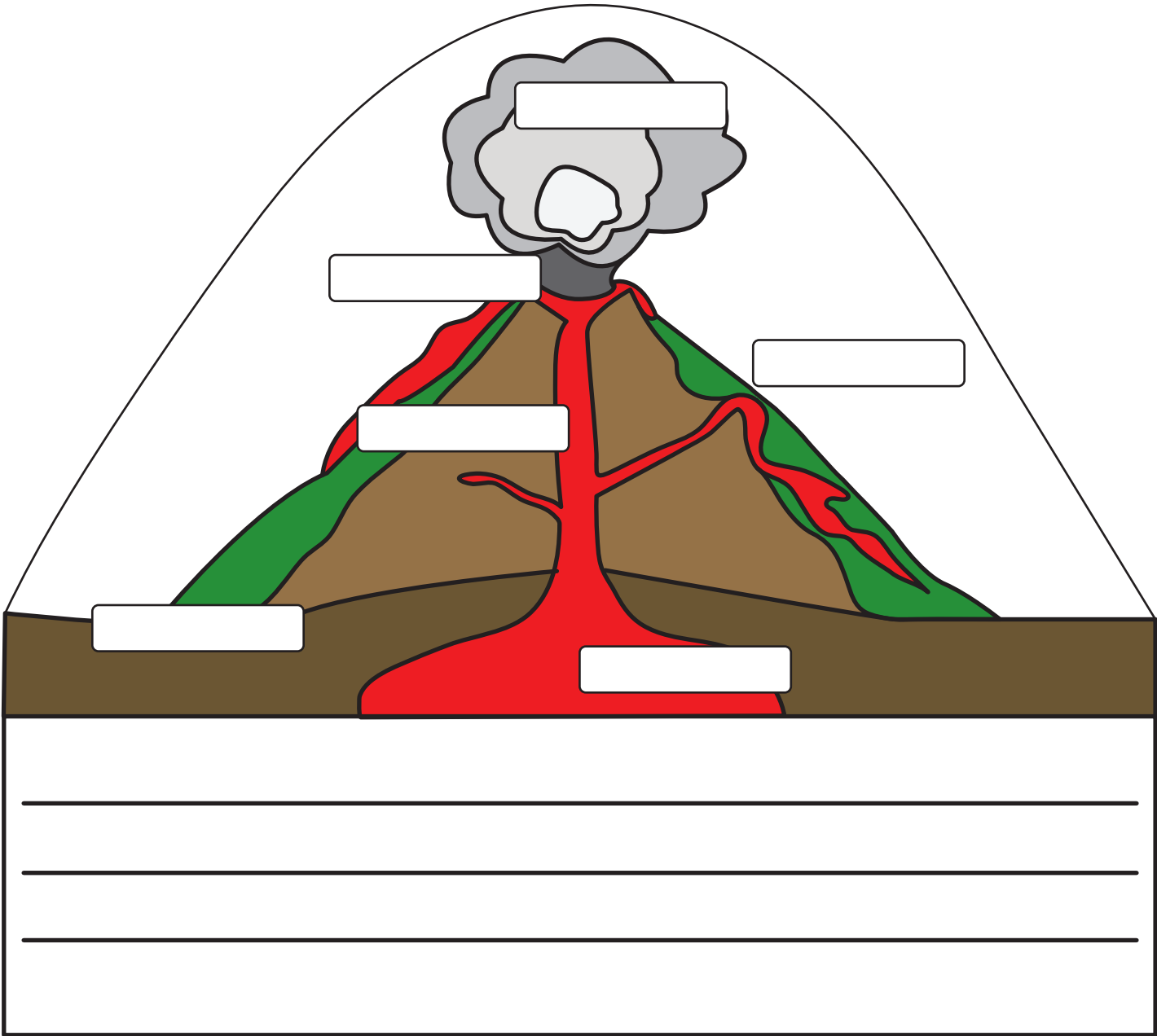
Pacific Ring of Fire



Types of Fault Lines

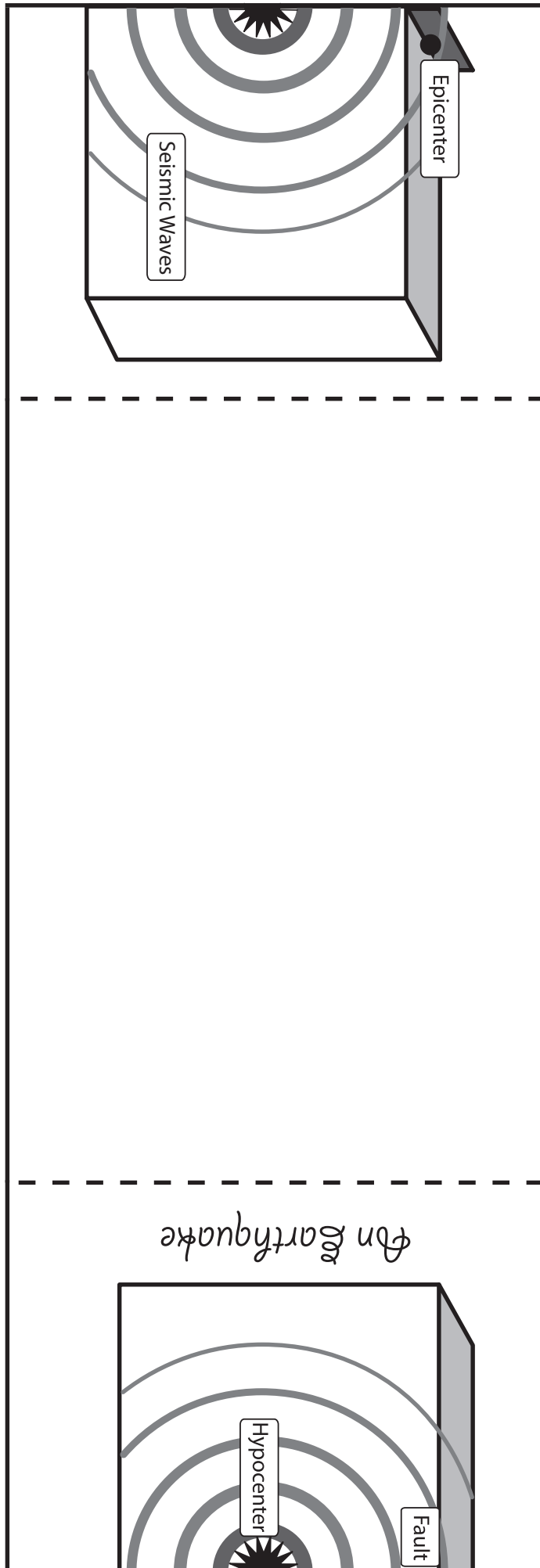
	
	
	

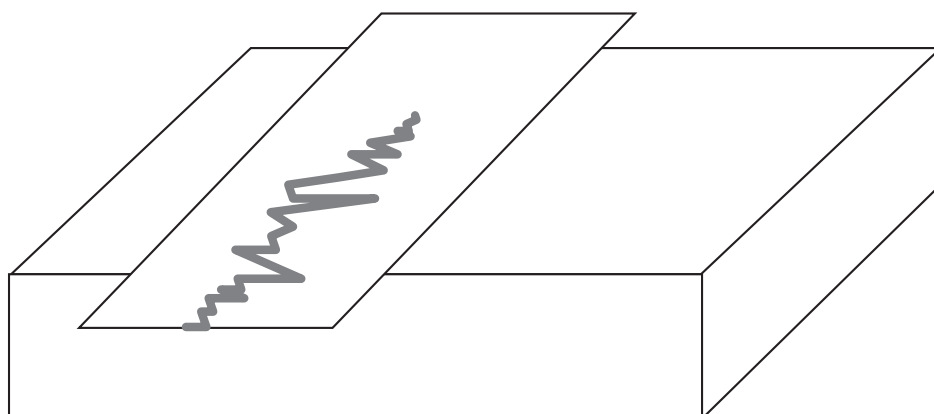
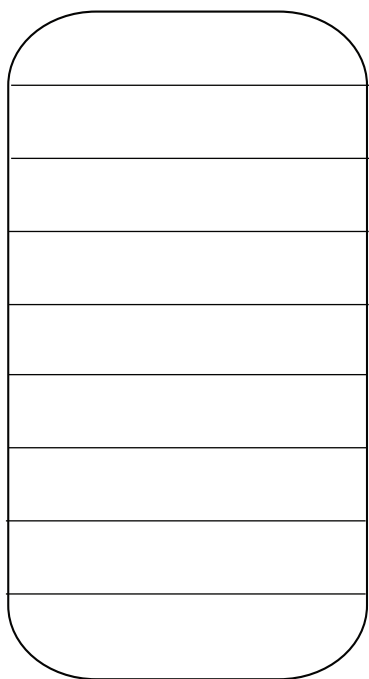




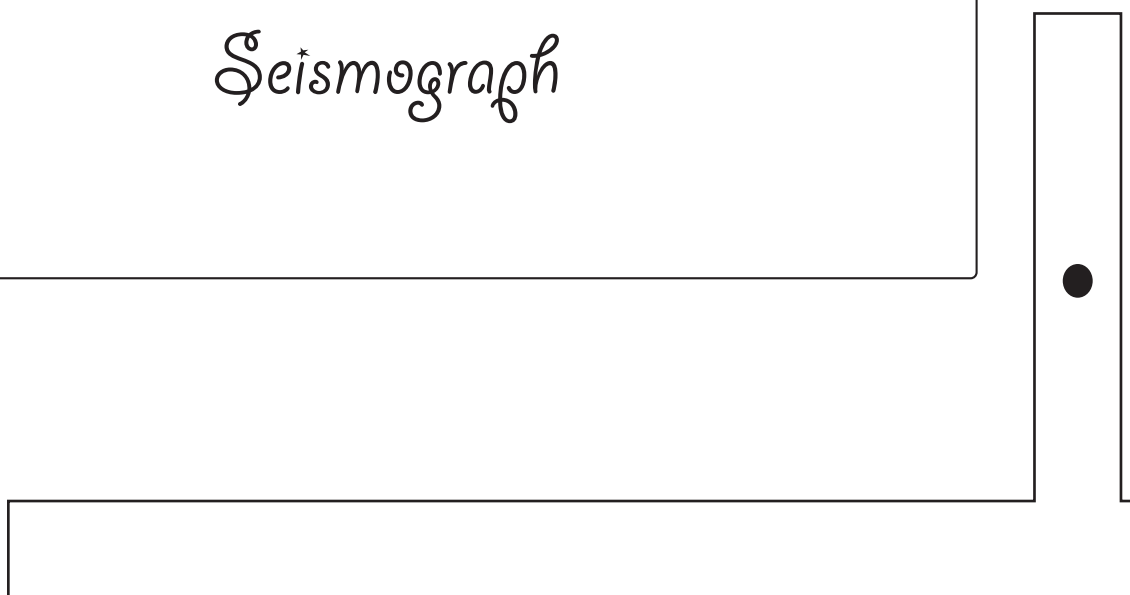
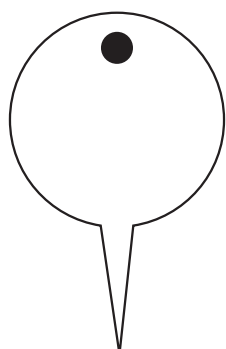


Inside a Volcano





Seismograph



[illegible]

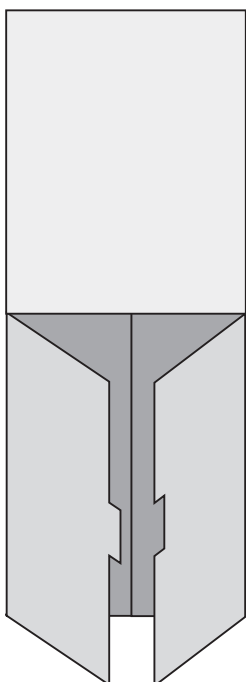
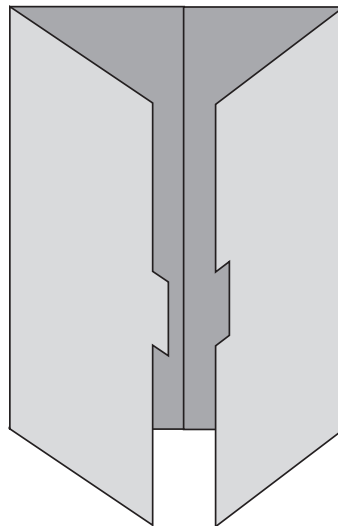
Earthquake
Emergency Supplies

How to fold a Lapbook:

For every lapbook you need a file folder. Open the file folder in front of you.



Fold both sides towards the midline so that it looks like this:



If there is not enough space in the lapbook, extensions can be added. Cut a file folder in half and paste it with cellotape to the top of the middle part. This adds two more pages to your lapbook.