

FORCES IN NATURE

The Earth beneath your feet – it's always there! So much so, that we forget about it most of the time. It is only when it does something that we remember that it is so important to us. Tremendous forces are at work in the Earth - building up, breaking down and carrying away material.

The Earth's crust can be altered by forces of nature that cause:

1. **VOLCANOES**
2. **EARTHQUAKES**
3. **FOLDING**
4. **FAULTING**
5. **INTRUSIONS**
6. **WEATHERING**
7. **EROSION**

1. *Are there any active volcanoes in Australia or in Australian Territories?*
2. *The Glasshouse Mountains of Queensland, Mount Gambier in South Australia and Cradle Mountain in Tasmania are all extinct volcanoes. Find out when one of these last erupted.*

ACTIVITY 3: VOLCANOES

Read the article below and use it to draw a cross-section of a typical volcano. Label your diagram with most of the terms in bold type.

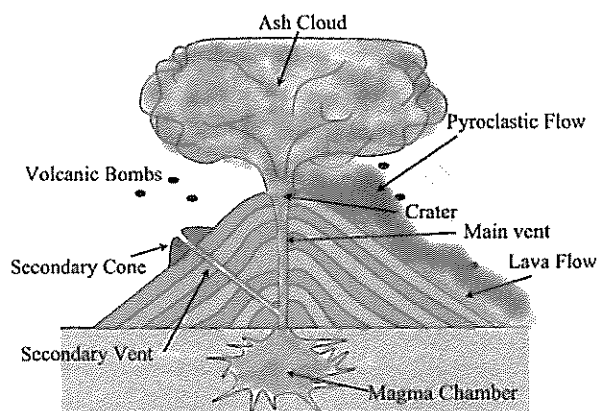
Along the plate boundaries there are massive forces at work in these areas of weakness in the Earth's crust.

There are no active volcanoes in Australia. A volcano which has not erupted for 25 000 years is said to be extinct. Volcanoes which are not erupting now but have done so in the last 25 000 years are said to be dormant. A volcano may remain dormant for 20 years or 5000 years between eruptions.

The liquid feeding a volcano is called **magma** – the material that makes up the mantle. Magma is a mixture of **lava** and **volcanic gases** and it pushes its way up the **vent** of the volcano to the surface. Volcanoes produce a lot of gas, which is ejected as the pressure inside the Earth is released at the surface often destroying part of the volcano as it erupts. In 1980 Mt St Helens in Washington State, USA blew out the side of the volcano and about 60 people are thought to have died.

Lava may be very runny or thick and pasty. Lava usually flows very slowly out of the **crater** of a volcano. Pasty lava may partly block the vent of a volcano, and if it contains large quantities of gas it can be very explosive. Some pasty lava is so full of bubbles that it is very light and can float. This lava when it solidifies to a rock is called **pumice**. If the lava has a lot of gas it begins to froth and results in a glowing cloud of **volcanic ash**. This ash can move out of the volcano at 200 km per hour. Solid fragments of rock vary in size from small pieces of ash up to giant boulders called **volcanic bombs**. These become solid in flight and if the pieces have lots of bubbles of gas in them they form a loose pile of rocks called **scoria**.

Any eruption where molten magma comes out of the earth and cools on the surface is called an **extrusion**.



Main Features of a Volcano

Webquest: Mount Merapi

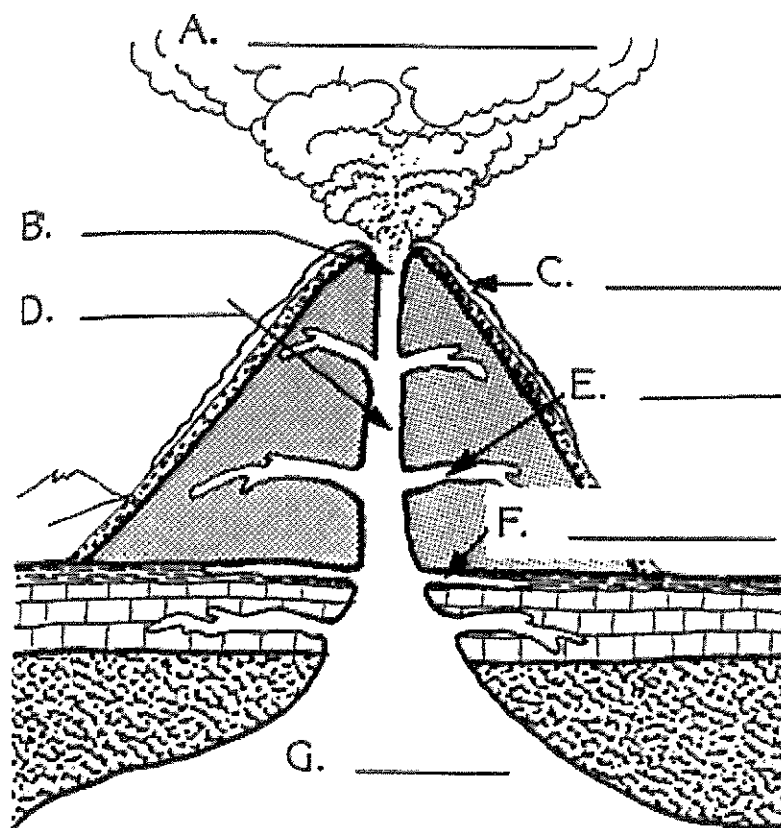


On the 25th October, 2010, Mount Merapi near Yogyakarta in Indonesia exploded sending ash and debris high up into the sky to rain down on the surrounding villages.

1. How many casualties were there?
2. What were the major causes of deaths and injury?
3. Had this volcano exploded before?
4. Why would people choose to live so close to an active volcano?
5. Suppose you were to lead an emergency team sent in from Australia to assist these unfortunate people. What would be some of the challenges you and your team would have to face in meeting the immediate and long term needs of these people?

<http://www.perthnow.com.au/news/top-stories/indonesian-volcano-erupts-20-hurt-by-hot-ash/story-e6frg12l-1225944122054>

VOLCANO WORKSHEET



1. Locate and label on lines A-G these parts of a volcano:

vent sill magma dike crater gases, ashes and cinders lava

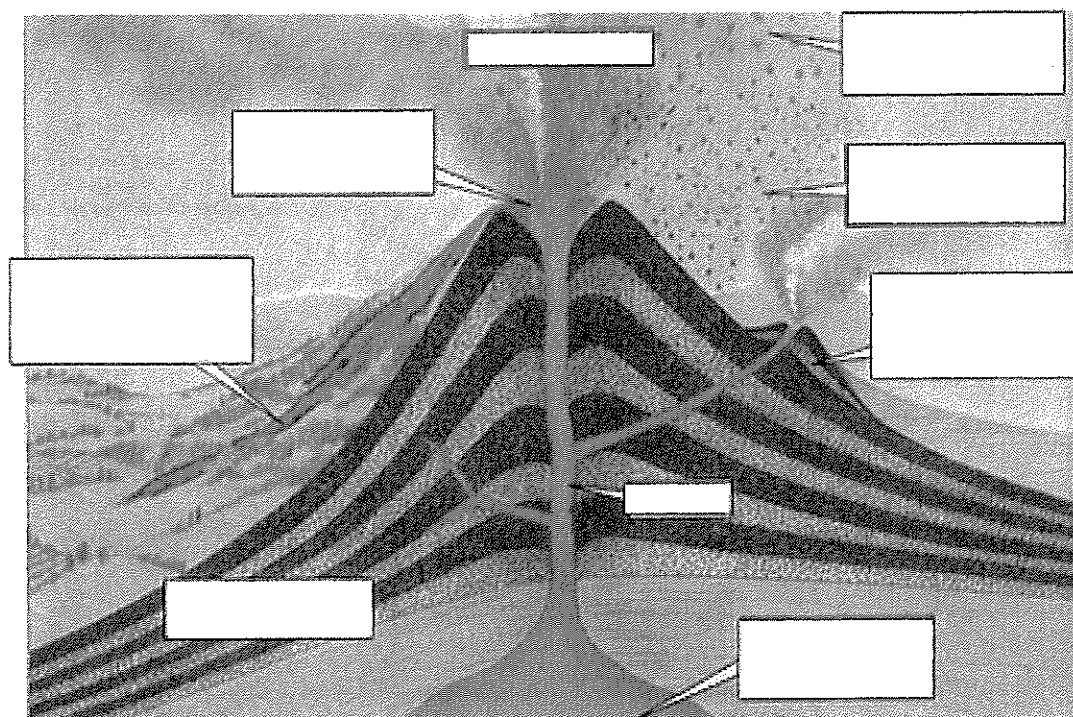
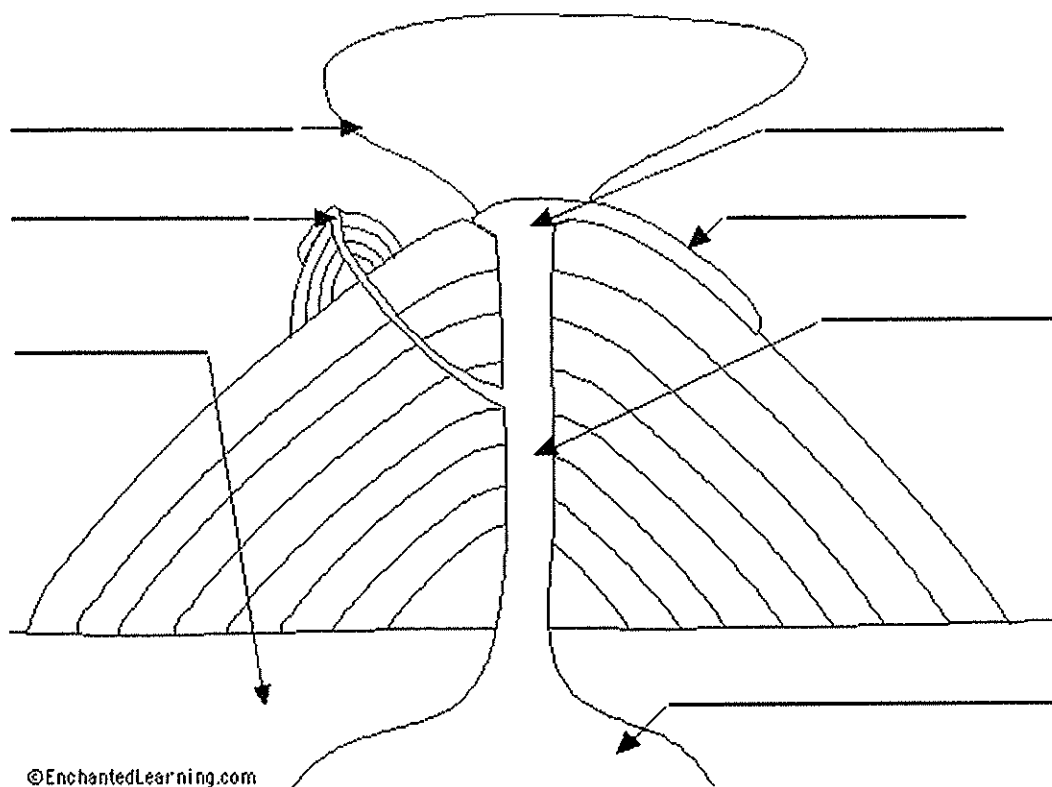
2. Write the number of the item in Column B on the line before its description in Column A.

Column A

- ___ a. molten rock deep within the earth
- ___ b. opening of a volcano
- ___ c. magma flow below surface of volcano
- ___ d. magma that reaches surface
- ___ e. connects pool of magma to crater
- ___ f. spewed into atmosphere during volcanic eruption
- ___ g. an active American volcano
- ___ h. magma flow across layers of volcanic cone

Column B

- 1. lava
- 2. vent
- 3. gases, ashes, cinders
- 4. magma
- 5. Mt. St. Helens
- 6. sill
- 7. dike
- 8. crater



VOLCANOES AND EARTHQUAKES

1. •Why is the mid ocean ridge in the middle of the ocean?
2. •What produces the force that pulls the plates apart?
3. •Where will the next Hawaiian volcano form?
4. •Why do some island chains (eg Indonesian area) run in different directions to the Hawaiian Islands?
5. •Why do chains of Pacific Islands form, one at a time?
6. •What makes us think that Iceland is part of the sea floor?
7. •What will Iceland look like in the future?
8. •Surtsey began as a soft ash island. Why didn't lava form hard rock right from the beginning?

9. •Why has the island lasted?
10. •Why do you think access to new islands is restricted to scientists such as those interested in studying ecology?
11. •Why does the earth quake so much when the plates rub past each other? •What do we mean when we say the plates “stick”?
12. •Tokyo has several earthquakes every day. Why?
13. •Why is San Francisco certain to have another quake? •How do tsunamis begin, thousands of kilometres away from the quake site?
14. •What is causing the buildings to fall in the old San Francisco film? (Look closely at the film.)
15. •Why do steep sided volcanoes form over downgoing plates?

16. •The film of Samoa showed a flat plateau with two different types of vent. How was each of these formed?
17. •Why did lava near the coast become colonised with plants more slowly than that further inland?
18. •Why would a breadfruit tree grow, when it is just stuck into the hardened lava?
19. •Do you get the feeling that lava is hard or soft?
20. •Low viscosity lava can be diverted easily even by stone walls. Why is high silica magma more difficult to handle?
21. •High silica (high viscosity) lava forms very strong gastight plugs in vents. Why should this be dangerous?
22. •Why was Krakatoa so violent?

23. •Why was there such a large tsunami produced?

24. •What is a “glowing cloud”?

25. •What would you do if you were at the scene of any of the above events?

26. •Have volcanoes helped us in any way?

RESEARCH

1. What are the gases given off by a volcano?

2. Do any other planets or moons have (or have had) volcanoes?