

1. How do volcanoes erupt?

The molten rock that comes out of a volcano has been brought to the surface by a combination of things. The main one is the force of gravity: the molten rock ("magma") is not as dense (heavy) as the rocks around it so it tries to go upwards, just as the heated wax in a lava lamp will rise. Another thing that helps it erupt are the gases (like carbon dioxide and sulphur dioxide) dissolved in it, which come out as bubbles as the pressure reduces when it nears the surface and can force it out explosively, a bit like when you shake up a Coke bottle and take the top off: the gas forces out the Coke in a fountain.

Sometimes magma comes up because there has been a large crack opened up between two of the giant plates which make up the Earth's crust. Iceland is positioned on a crack like this. Sometimes magma is produced because one of these plates has been pushed deep into the Earth and melting has happened near the edge. It may not be in the plate itself, but in the zone above it affected by water coming out of the plate. This is why there are volcanoes on Bali. Sometimes there is a hot spot or plume of hot melted material coming up underneath the middle of a plate, hot enough to punch a hole through. Hawaii is an example of this.

2. How big can volcanoes get?

The largest volcano we know about is not on the Earth at all. It is on Mars, and is called "Olympus Mons". It is 24 kilometres high, getting on for 3 times higher than Everest. The largest volcano on Earth, Mauna Kea in Hawaii, is only 10 kilometres high, and that is counting all that you cannot see of it, down to the ocean floor.

3. How small can volcanoes be?

It depends what you mean by this. You can get tiny cones only a few metres high, but these are usually part of a much bigger volcanic eruption. Probably the smallest I can think of in Australia are the diamond pipes up in the Kimberley. These are special kinds of skinny volcanoes which have punched through the Earth's crust pipes which may only be a few tens of metres across.

4. When did Mt Helens erupt?

In May, 1980.

5. Have you been on a volcano before and if so what did it feel like?

Yes, I have been on several volcanoes: lots, if you count the rocks from very old volcanoes. The best ones were in Iceland. The new basalt lava flows were very shiny and black, but the top layers were like a glassy sponge because of all the glass bubbles. As you walked along you were crunching this stuff to bits. You could break this material in your hands and some looked exactly like black Crunchie Bars. Some of the gas is the same as in a Crunchie: it is carbon dioxide, and lots is released into the atmosphere when a volcano erupts, often affecting the environment (it's a 'greenhouse gas'). Some of the gas is sulphur dioxide, which combines with moisture in the atmosphere to produce sulphuric acid and acid rain. A recent eruption in the Philippines blanketed the whole Earth with acid droplets in the atmosphere.

You can see the shapes of the lava as it flowed, like walking down the middle of a frozen river. There were slabs of cooled lava piled up by the flow continuing, and "bombs" of lava which had been shot into the air and cooled down, and landed back on the ground. There was also "pele's hair" which is bits of brown lava glass drawn into fibres: this had been blown by the wind and banked up against obstructions, looking like swathes of dry grass. Another type of rock which had been erupted was volcanic ash and pumice. The pumice pebbles floated on any water, so you would walk on to what looked like a pebbly area and go straight through into a pool of water. Sometimes the ash had erupted on to snow, so there were layers of snow and ash and lava alternating in a cliff face.

There were also many hot springs and smelly holes where volcanic fumes were coming out. Some of these had lots of sulphur so smelled like rotten eggs. We swam in the hot springs: some were in caves and hotter than a bath would be.

6. Do you like volcanoes?

Of course! There are many different kinds of volcano, depending on the composition of the magma (like different cake mixes produce different cakes) so there are a lot more I would like to see, and I have always been unlucky in that I have just missed being there at an eruption. Volcanoes have erupted throughout geological history, and the first surface of the Earth would have looked like a giant lava flow as it was all melted.

7. Do you know a good website to look up volcano information?

A good volcanoes website is at: <http://volcano.und.nodak.edu/>

It is called "Volcano World" and is put out by a University which means that the information should be reliable. The problem with the web is that, unlike a book, nobody checks out what people have written and sometimes it is quite wrong. This site has lots of good links to other excellent websites.

8. What are the signs that a volcano is about to erupt?

Usually there are some small earthquakes which could be due to the magma squeezing through the crustal rocks. The area where the eruption is due will swell up like a dome, so you can measure the angle of tilt of the rocks and the height with simple equipment. There may be more fume activity, or a change in the kinds of gases produced, and hot springs will get hotter.

9. What part of the world do you find the most volcanoes?

You find the most volcanoes where there is either:

- a) two plates pulling apart so that magma can form because of the release of pressure and come up the crack. In fact, the mid-ocean ridges along the centres of ocean floors where plates are pulling apart are like one long thin volcano, or
- b) where one of the plates is ducking down or being pushed down under another. As it goes down into hotter, high-pressure regions, melting will start in the area and the melted stuff migrate up to erupt at the surface. If it doesn't quite make it to the surface it will go solid while still in the crust and form a big lump of a rock like a granite: we see these in WA where the rocks originally above the granite have been worn away by weathering and erosion.

10. What season do volcanoes usually erupt?

No-one has proved if there is any real effect of the Earth's rotation on the eruptions, although it is possible that, like the tides, the gravitational pull of the Moon may help some eruptions along. Why don't you do this as a survey, by finding out what times of year various volcanoes have erupted? Remember that in the Northern Hemisphere the seasons are different! You may find that the date makes no difference.