THE FURNACES OF THE EARTH

The titanic forces that built the Himalayas and all the other mountains on earth proceed so slowly that they are normally invisible to our eyes. But occasionally they burst into the most dramatic displays of force that the world can show. The earth begins to shake and the land explodes.

If the lava that erupts from the ground is basalt, black and heavy, then the area may have been continuously active for many centuries. Iceland is just such a place. Almost every year there is volcanic activity of some kind. Molten rock spills out from huge cracks that run right across the island. Often it is an ugly tide of hot basalt boulders that advances over the land in a creeping unstoppable flood. It creaks as the rocks cool and crack. It rattles as lumps tumble from its front edge. Sometimes the basalt is more liquid. Then a fountain of fire, orange red at the sides, piercing yellow at its centre, may spout 50 metres into the air with a sustained roar, like a gigantic jet engine. Molten basalt splashes around the vent. Lava froth is thrown high above the main plume where the howling wind catches it, cools it and blows it away to coat distant rocks with layers of grey prickly grit. If you approach upwind, much of the heat as well as the ash is blown away from you, so that you can stand within 50 metres of the vent without scorching your face, though when the wind veers, ash will begin to fall around you and large red-hot lumps land with a thud and a sizzle in the snow nearby. You must then either keep a sharp eye out for flying boulders or run for it.

Flows of cooling black lava stretch all round the vent. Walking over the corded, blistered surface, you can see in the cracks that, only a few inches beneath, it is still red hot. Here and there, gas within the lava has formed an immense bubble, the roof of which is so thin that it can easily collapse beneath your boot with a splintering crash. If, as well as such alarms, you also find yourself fighting for breath because of unseen, unsmelt poisonous gas, you will be wise to go no further. But you may now be close enough to see the most awesome sight of all – a lava river. The liquid rock surges up from the vent with such force that it forms a trembling dome. From there it gushes in a torrent, 20 metres across maybe, and streams down the slope at an astonishing speed, sometimes as much as 100 kilometres an hour. As night falls, this extraordinary scarlet river illuminates everything around it a baleful red. Its incandescent surface spurts bubbles of gas and the air above it trembles with the heat. Within a few hundred yards of its source, the edges of the flow have cooled sufficiently to solidify, so now the scarlet river runs between banks of black rock. Farther down still, the surface of the flow begins to skin over. But beneath this solid roof the lava surges on and will continue to do so for several miles more, for not only does basaltic lava remain liquid at comparatively low temperatures, but the walls and ceiling of solid rock that now surround it act as insulators, keeping in the heat. When, after days or weeks, the supply of lava from the vent stops, the river continues to flow downwards until the tunnel is drained, leaving behind it a great winding cavern. These lava tubes, as they are called, may be as high as 10 metres and run for several kilometres up the core of a lava flow.

Iceland is one of a chain of volcanic islands that runs right down the centre of the Atlantic Ocean. Northwards lies Jan Mayen; to the south, the Azores, Ascension, St Helena and Tristan da Cunha. The chain is more continuous than most maps show, for other volcanoes are erupting below the surface of the sea. All of them lie on one great ridge of volcanic rocks that runs roughly midway between Europe and Africa to the east, and the Americas to the west. Samples taken from the ocean floor on either side of the ridge show that, beneath the layers of ooze, the rock is basalt, like that erupting from the volcanoes. Basalt can be dated by chemical analysis and we now know that the farther away from the mid-ocean ridge a sample is taken, the older it is. The ridge volcanoes, in fact, are creating the ocean floor which is slowly growing away from them, on either side of the ridge.

The mechanism that produces this movement lies deep within the earth. Two hundred kilometres down, the rocks are so hot that they are plastic. Below them, the metallic core of the earth is hotter still and this causes slow, churning currents in the layers above, which rise up along the line of the ridge and then flow out on either side, dragging the basaltic ocean floor with them like solid skin on custard. Such moving segments of the earth's crust are known as plates. And most of these plates carry on them, like lumps of scum, continents.

Vocabulary