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HOW THE CONTINENTS MOVE

HAVE YOU EVER looked at a map of the world and thought that South America and Africa would fit together like pieces of a jigsaw puzzle? Back in 1620, Sir Francis Bacon thought so. Off and on ever since, there have been scientists who believed all the continents were once part of a single, big land mass that split apart. Mostly these scientists were laughed at--until about twenty-five years ago when this idea was accepted as a valid theory. Now most everyone agrees that the crust of the earth is constantly shifting. The study of all this movement is called plate tectonics. Plate refers to the giant jigsawlike pieces that make up the earth's outer layer. Tectonics means building or construction.

Geologists believe that about 225 million years ago all the continents were jammed together in one big land mass, which is now called Pangaea, a Greek word meaning "all lands." There are several clues that led to the theory of Pangaea. Sir Francis Bacon noticed the first clue: the close fit of Africa and South America. But it is also interesting to see how Canada, Greenland, and northern Europe could be squeezed together into one big land mass. This idea of a huge jigsaw puzzle is important. But unfortunately, it alone is not enough to support the existence of Pangaea.

More clues are found in the rock formations along the coasts of the Atlantic Ocean. Rocks on Africa's Ivory Coast and in Brazil are alike. So are those in Scotland and in Labrador; on the island of Madagascar and in India. There are also similar fossils found along these coasts. It is unlikely that the same ferns and snails developed an ocean away from one another. So scientists see this as more evidence for the theory of continental drift.

Another major clue is the evidence of changes in climate. For example, coal has been found in Antarctica. Coal is formed by slow, continual pressure on dead plants. So trees and other plants must have once grown there before the temperature dropped so low. Also, glaciers, which are huge, slow-moving masses of ice, have left marks in the rocks of South America. As warm as that continent is now, a glacier would certainly melt there. So perhaps these lands were once in different spots on the globe, places where plants would grow or ice wouldn't melt.

All these clues together make a strong case for the theory of continental drift. But what causes all the continents to shift around?

Geologists tell us that the earth's crust is made up of thirteen major plates or chunks

that move around on the fluid, inner part of the earth. The names of these plates are Eurasian, African, Antarctic, North American, South American, Caribbean, Cocos, Nazca, China, Pacific, Philippine, Indian-Australian, and Arabian.

These plates are composed of two different kinds of crust material: one kind is the continental crust, and the other is the ocean floor. The continents, which are made of the continental crust, are much older than the ocean floor. They are also lighter (less dense), so they float high on the liquid inner part of the earth--like ice cubes in water. The ocean floor is thinner and denser, so it doesn't float as high.

The plates, which are usually made of combinations of continental crust and ocean floor, change shape and size as they move apart or as they jostle and crunch against one another. One example of this is the long, underwater volcanic mountain range called the Mid-Atlantic Ridge, which runs north and south down the center of the Atlantic Ocean. At this ridge, the two plates containing South America and Africa are separating, and at the same time new crust is being created. It happens like this: as the plates move away from each other, magma from deep inside the earth flows up through the ridge like a volcano and hardens into rock. This pushes the plates even farther apart and also adds new material to the plates.

This process occurs very slowly (the plates move about 25 millimeters in one year--that's about the width of two fingers!), so it is not something we can see happening. Geologists can tell us what's going on only by examining bits of evidence. For instance, they can determine the age of the rocks on the ocean floor and on the continents. The oldest rocks found on the ocean floor are 150 million years old. The rocks on the continents, however, are much older--over 3,500 million years old. Rocks collected right at the ridge are relatively new, no older than 1 million years. This supports the idea that the crust is formed at the ridge.

While new crust is being created in one spot, it must be destroyed in another. As one plate pushes against another, the heavier ocean crust sinks below the continent and the adjoining plates and is melted back into the hot, inner part of the earth. The ocean crust is constantly being recycled like this, which is why none of it is as old as the continents.

When the ocean crust slides below the continents, it disturbs the land above it and causes earthquakes and volcanoes. This is why California has so many earthquakes. In fact, most earthquakes happen along the edges of plates. So if you read about a place that has a lot of trouble with volcanoes or earthquakes, you can probably assume that the edge of a plate is there. Japan is a good example; so is the western coast of South America.

Some of the plate edges are not near a shoreline. When they push against each other, neither sinks. The land crumples up instead, and mountains are created. The Himalaya Mountains are an example of this. Mount Everest, the world's highest peak, is located there.

It may seem a bit strange that the earth can be moving and changing right under us all the time, but it happens so slowly that we can't see the change in a lifetime. We have only the earthquakes to remind us that anything is going on at all. But if we could live for millions of years, we might be able to climb a mountain in a spot that is now low and flat or stand on the coast of California and wave to the people in Japan.

MAP: ANTARCTIC PLATE

ILLUSTRATIONS

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