

The plate tectonic story: a scientific jigsaw

The idea of plate tectonics to explain that Africa was once joined to South America may seem obvious now but when Alfred Wegener published a scientific paper about 100 years ago suggesting that the continents had drifted apart everyone thought he was mad. He wasn't the first person to notice that the coastlines looked similar. Even Francis Bacon in 16th Century had written about it. But Alfred was the first person to put forward a lot of scientific evidence that they had been joined.

It was the fossils that did it. Alfred pointed out that the fossils in Africa and South America were remarkably similar – up to a point. It was obvious to him that the two landmasses had been joined and so the same animals had lived in both. Slowly the continents had drifted apart and the animal populations had evolved after that in different ways. He also spotted that the rock types in the two continents were similar too. 'Perhaps', he suggested, 'there was once only one land mass and one huge sea'. He named his giant continent Pangea and the giant sea Panthalassa

Other scientists were not convinced. They claimed that there had been land bridges between all the continents to allow the animals to walk across from one continent to the other. These bridges had long ago sunk into the sea, they argued. They certainly couldn't believe that whole continents were on the move!

It took 50 years – during which time the continents had moved another 1.75 m on average – before people finally realised that Alfred had been right all along. By the 1950s scientists were making measurements of the ocean floor – and they began to find some very strange things. They discovered long ridges of mountains with magma rising to the ocean floor in the middle of them. They also found that the rock closer to the ridge was much younger than the rock further away. The only explanation was that the two halves of the ocean floor were moving apart and new rock was forming in the gap.

And when the scientists looked at the magnetic rocks on the ocean floor they found they were magnetised in opposite directions. Each time the Earth's magnetic field had reversed direction, the new rock appearing at the surface was magnetised in the same direction as the Earth's field at that time.

From this it was a short leap to the idea of **plate tectonics**.

Alfred would have been delighted to know he had been on the right lines all along. We now believe that the Earth is covered by plates that move slowly (*eg* around 35 mm per year – or the same rate as your finger nails grow) carried by the mantle. As the plates move together the rocks between are crushed and form mountain belts, other rock is forced down into the mantle. When plates move apart new rock rises up and solidifies to fill the gap.

All the time geophysicists are working to understand better how the Earth works. They are now working on new ideas about how the mantle moves called 'mantle dynamics'. It is possible that the new ideas will help us to predict when earthquakes will occur and when volcanoes will erupt, but we're not there yet! However, we may soon be able to map the stress on the Earth's surface, which should give us more of the information needed to warn people of an imminent earthquake.

Questions

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| <p>Q 1. Why did Alfred find his theory was not accepted by other scientists?</p> <p>Q 2. What evidence resulted in his basic idea being accepted after all?</p> <p>Q 3. Explain the theory of plate tectonics</p> <p>Q 4. How do we believe that landmasses move about?</p> |
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- Q 5. Scientists publish their findings in journals for other scientists to read. Why is it important for scientists to read what their colleagues around the world are doing?
- Q 6. Before a scientific paper can be published it has to be 'refereed' by other experts in the field. If Alfred had written a scientific paper, do you think the referees would have accepted it for publication? Explain your answer.