My late friend, the Rev'd Meredith Powell knew of my interest in geology, and asked me to provide articles for inclusion in the Llanidloes Baptist Chapel publication of the "Net". The congregation knew little of geology, so the articles were simple and easy to understand.

I do miss my friend.

The Net Winter 2008

GEOLOGY – *PART 1*

By Bill Bagley

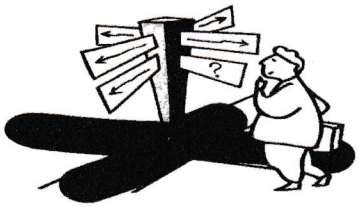
Geology is the study of the rocks which make up the surface of the Earth and to interpret the landscape to find out just what has happened to the Earth over million of years, and is still happening today. This little series of geological explanations will attempt to explain what we have learned and will especially concentrate on the geology of Wales.

However, before we come to the geology of Wales, we must start at the very beginning and the formation of the Earth :-
Billions of years ago Earth was not as it is now. Earth was approximately two thirds the size that it is today and there was no moon. Most recent thinking is that there was a smaller planet than the Earth which was also orbiting the sun. The Earth and the smaller planet got too close to each other and probably helped by gravity they collided. This was a cataclysmic event of gigantic proportions creating a massive explosion and resulting in the melting of both planets, which eventually coalesced into a new planet, or should we say a new larger Earth.

Next time the creation of the moon and its importance in helping to sustain the life giving conditions on Earth.

The magazine of the Baptist Church Llanidloes

The Net



Llanidloes Baptist Church

Spring 2008

GEOLOGY PART 2

by Bill Bagley.

4.5 billion years ago the Earth was in collision with a slightly smaller planet. The two planets merged together and a new enlarged Earth was created. This was a very violent event and as a result 70% of the Earth's crust was blasted into space. For a very long time the Earth had the appearance of a fireball, and the millions of pieces of rock which did not escape Earth's gravitational pull, settled into orbit. The earth gradually cooled down, and at the same time the orbiting fragments of rock collided with each other and merged into larger, and yet larger pieces, rather like a snowball increasing in size as it is rolled along. As the pieces got larger they produced their own gravity and so all the pieces of rock were eventually attracted to each other to create a single large rock – the moon.

The newly formed moon was at least ten times closer, and possibly twenty times closer, to the Earth than it is today. Because it was so close to the Earth, the moon's gravity caused the tides to be at least 1000 times higher than today. The newly formed Earth was very disturbed, and very volcanic, and the massive tides brought immense amounts of debris from the land into the seas. It was in the seas that life evolved, aided by the salts and the minerals contained in the debris. Without the moon's affect on the tides this might not have happened. Even so, it was millions of years before life did evolve, and it is thought that that life, in the form of single cell organisms, first appeared 3,800, million years ago. The organisms probably started life in mud flats in tidal regions, tidal regions which would not have been there but for the effect of the moon's gravity.

The evolution of life and its explanation would require a chapter on its own, but a few facts need mentioning which have had an affect on that evolution. Firstly, when the two planets collided, they both had liquid iron cores and these were then incorporated into one. As a result the Earth has a much larger iron core that it has a right to expect. This iron core produces a very powerful magnetic field. It is this magnetic field which repels the Suns solar wind. If the solar wind and its harmful radiation did reach the surface of the Earth, life would not be able to exist.

The newly formed moon was at least ten times closer, and possibly twenty times closer, to the Earth than it is today. Because it was so close to the Earth, the moon's gravity caused the tides to be at least 1000 times higher than today. The newly formed Earth was very disturbed, and very volcanic, and the massive tides brought immense amounts of debris from the land into the seas. It was in the seas that life evolved, aided by the salts and the minerals contained in the debris. Without the moon's affect on the tides this might not have happened. Even so, it was millions of years before life did evolve, and it is thought that that life, in the form of single cell organisms, first appeared 3,800, million years ago. The organisms probably started life in mud flats in tidal regions, tidal regions which would not have been there but for the effect of the moon's gravity.

The evolution of life and its explanation would require a chapter on its own, but a few facts need mentioning which have had an affect on that evolution. Firstly, when the two planets collided, they both had liquid iron cores and these were then incorporated into one. As a result the Earth has a much larger iron core that it has a right to expect. This iron core produces a very powerful magnetic field. It is this magnetic field which repels the Suns solar wind. If the solar wind and its harmful radiation did reach the surface of the Earth, life would not be able to exist.

The collision also imparted a tilt and a spin to the Earth. The tilt gives us our different seasons, and the spin gives us night and day.

Secondly, the affect of the moon on the earth's tides as well as its affect on the circadian rhythm of animals has been instrumental in determining the progress of animal life. The Earth is perfect for the maintenance of life having just the right temperature, the right amount of water, the right distance from the Sun, the right magnetic field to shelter us from the solar wind, and the right breathable atmosphere. If any one of these things were not just right, we would not be here.

In Part Three I'll attempt an explanation of how the continents have moved around the globe, for instance: Wales started life well below the Equator, very close to where Australia is now.

The Story of the Earth

Part three.

By Mr Bill Bagley

The Earth's collision with and absorption of a smaller, Mars size planet, left the Earth in a "fireball" condition for many millions of years, but eventually, the Earth started to cool down and stabilise.

Today, the Earth is more or less divided into four distinct parts. Firstly the inner core which is solid iron and is about 825 miles thick. Then comes the outer core which is liquid iron and is 1200 miles thick. Next is the mantle which is composed of liquid rock and is 1750 miles thick. Finally comes the crust, the land we live on, and this is only 25 miles thick and can be considered as the hardened surface, or skin on the liquid rock of the mantle. So the part of the earth we live on, the crust of the mantle, is like the skin on a rice pudding.

There are two types of crust. One is the Oceanic crust, which is beneath the oceans, and the other, the Continental crust, which is the land that we live on. The Continental crust was almost fully developed by 450 million years ago, but the continents at that time bore no relation to the size and position of the continents today.

The area of crust which would eventually become Wales was landlocked in a super continent known as Gondwanaland. Gondwanaland was located well below the equator, and contained other areas of land we now know as Africa, India, Australia, New Zealand, South America and Antartica. After Gondwanaland broke up Wales began its journey northwards, across the world, as did the other countries. The journey took about 400 million years until Wales finally ended up where it is today.

The fact that the continental crust could move around the earth was not discovered until the mid 1950s when it was noticed that Africa, America, India, Australia etc had shapes that could be fitted together just like a giant jigsaw puzzle.

Next time – The adventures of Wales as it undertook its epic journey from near the South Pole to where it is today.

The Net
Spring 2009

Geology – Part 4

Bill Bagley

Wales did not start life in its present position on the Earth. Wales actually originated from somewhere very near the South Pole. The story of it's journey across the globe could easily be very technical in it's description, accordingly the following account is necessarily very basic.

About 50 years ago it was noticed that all the major continents would fit together, somewhat like a big jigsaw puzzle (It had been noticed many years earlier, but no-one took any notice). The reason that the observation was now taken more seriously was that another discovery had been made with the use of new technology. With echo-sounding equipment and other technical advances a huge mountain range 40,000 miles long was discovered snaking through the very deepest parts of the worlds major oceans. It was then deduced that this mountain range had been formed from material welling up through the Earths crust with the effect of pushing apart the "plates" on which the continents sit. The movement is almost imperceptible, only an inch or so each year, but over millions of years, the distances can be measured in many hundreds, and sometimes thousands of miles.

Before going any further a description of the term plate is needed. All the major continents sit upon these plates, of which there are about ten with a few smaller ones. The plates vary in thickness from 30 miles to 100 miles. In comparison with the size of the Earth, the crust, which is made up of these plates is very thin, and could be compared to the skin on a rice pudding.

Once the theory of plate movement was established, scientists were able to work out the history of these movements and deduce the original position of today's continents. Originally, about 700 million years ago there was only one land mass on the Earth comprised of all of the modern day continents, and Wales was somewhere in the middle of it. The landmass has been given the name Pangea. Of course there was only one

ocean and this has been called Panthalassa. Time passed and by 450 million years ago the one landmass had now split into two, roughly North and South. The northern one was called Laurentia, and comprised of what were to become North America and Asia, and a little bit that was to become Scotland. The southern landmass was called Gondwanaland, comprised of what were to become South America, Africa, Australia, Antarctica, and also the other half of the British Isles. The movement continued, and eventually the landmasses broke up into the recognisable shapes of today's continents.

Over the next million years the continents moved halfway across the face of the Earth till they occupied today's positions. They are still moving at the rate of an inch or so each year, so in 50 million years time, the British Isles will be much nearer to the North Pole. The British Isles, including Wales did not become as one till about 420 million years ago, when Scotland, which was originally joined to Newfoundland drifted across the Iapetus ocean and collided. The join is very obvious and is even noticeable on maps.

Over the past 700 millions years Wales has moved from somewhere near the South Pole, up across the equator, and is now well on the way to the North Pole. Consequent of this movement Wales has experienced Arctic conditions, desert conditions, tropical forests, a period of time as a sea basin, also volcanic activity, massive folding and uplifting of the rocks and several ice ages.

Some of these different conditions have left their evidence in the rocks and landscape of Wales, and next time I will expand on this further.