Geological Evolution

Wegener's Theory of Continental Drift

In 1912, a German scientist named Alfred Wegener noticed that the continents seemed to all fit together like a big puzzle. He determined that they must have all fit together at one point in time. When all the continents were together they formed one large landmass, which Wegener named **Pangaea** (see picture to the left).

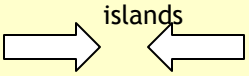
Wegener suggested that over a long time the continents broke apart and slowly drifted to where they are today. He called this idea **continental drift**.

So how did they move?

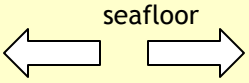
The **theory of plate tectonics** explains how the continents moved to where they are located today. This theory states that the continents are on top of large **tectonic plates** that move around on top of magma (the asthenosphere). Heat currents from the Earth's hot inside push these tectonic plates together and apart from each other, causing them to move.

A place where 2 plates meet is called a **boundary**. There are 3 main types:

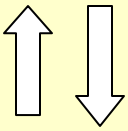
1. **Convergent**- where plates push towards each other.
    a. Land is pushed up to make mountains or islands



2. **Divergent**- where plates pull apart from each other.
    a. Magma rises up from below to create new seafloor



3. **Transform**- where plates slide past each other.
    a. Many earthquakes happen at these boundaries!



In this Issue….

So prove it! (Continental drift, that is!)

We have 2 big pieces of information that help to prove that continental drift truly did happen!

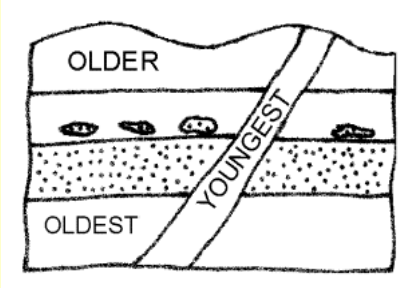
The first way to prove that Wegener was right is to look at the continents! They really do fit together like a puzzle, so it only makes sense that at one point they all were stuck together.

The second and more convincing proof is a fossil. Not just any fossil…the fossils of an organism called the **Mesosaurus**. The Mesosaurus lived more than 250 million years ago. Scientists have found fossils of the Mesosaurus on both South America AND Africa! Because the fossils were found in two locations this helps prove that the continents were once stuck together. Scientists know that the Mesosaurus could not swim in salt water (so it couldn't swim in the ocean from 1 place to another). Therefore, in order to find the SAME fossils on both continents they must have been together and then drifted apart.

Weathering

Determining the Age of Rocks

Scientists can look at layers of rock to figure out how old certain fossils are. When we do not know the **absolute age** (or the true age) of a fossil we can usually find the **relative age**. We find the relative age of a rock or fossil by comparing it to others around it. The Law of Superpostion helps us determined the relative age of rocks and fossils. **The Law of Superposition** states that the oldest rock layers are on the bottom and the newest rock layers are on the top.



Unconformity (sometimes things get a little messed up!)

Sometimes movement from the plates can disturb the rock layers. When this happens, it makes it very hard for scientist to figure out the age of rocks and fossils. There are 4 main type of **unconformity**:

1. **Undisturbed**- when nothing is wrong! Everything is where it is supposed to be. (old on the bottom, new on the top).
2. **Fault-**A break in earth's surface. As plates move past each other, earthquakes can happen.
3. **Erosion-**When earth and soil move because of wind, water, ice, or gravity
4. **Folding-**When earth gets bent because of pressure. It looks wavy.
5. **Intrusion**- When volcanic rocks cut through the rock bed. This volcanic rock that has intruded will always be the youngest.

Mapping the Earth

Scientists work to keep track of the earth's **topography** (the study of earth's natural and artificial features). Scientists will oftentimes use **topographic maps**, which are maps that show the elevation (how high stuff is) on earth.

Scientists like to keep track of how the earth is changing so they'll know how humans are impacting the earth. It also helps us determine how earth has naturally evolved, or changed over time.

A lot of times, scientists will make maps using satellites. We call it **remote sensing** when scientists make a map without actually visiting a place. We call it **ground truthing** when scientists visit a place to make sure the map they made is correct.

Weathering

Weathering is a process in which rocks are broken down into smaller pieces through the action of wind, water, roots, and animals. There are 2 Types of Weathering:

1. **Mechanical weathering**- when rocks are broken apart without changing their chemical composition. They are still rocks…just in a different shape. This happens when plant roots break through, when the wind blows too hard, when animal dig holes and even if water flows over something for a long period of time.
2. **Chemical Weathering**- when the chemical composition of something is changed. Air, salt, water, and acids may react with the minerals in rocks to form new substances. Chemical weathering can destroy statues like the Statue of Liberty. Chemical weathering can even carve out HUGE caves in rock!