

What are  
uniformitarianism  
catastrophism and  
plates tectonic history  
essay



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## **Introduction:**

The following report will outline and discuss the work of scientists; Sir Charles Lyell, James Hutton, Alfred Wegener and Harry Hess. It will also explain how their work influenced the development of earth science from the time they made their theories/observations to today.

## **What are uniformitarianism, catastrophism and plates tectonic:**

### **Uniformitarianism:**

Uniformitarianism has took many, many years to be understood, proven and actually used as a theory on how things happen on and to the earth.

When scientists started to understand the ways in which mountains and volcanoes are formed and why deep sea trenched occurred etc, they began to realise that such things as these did not happen in a matter of minutes due to a catastrophic incident. It's by natural causes and slow movements. As the motto for uniformitarianism is “ the present is key to the past” which literally means everything that happens today is an indication of what happened in the past, dealing with the same occurrences.

The dictionary definition is: “ Geology. Of or pertaining to the thesis that processes that operated in the remote geological past are not different from those observed now.”

### **Catastrophism:**

Catastrophism was around for a long time before uniformitarianism and was chosen as the favoured theory for a long time before uniformitarianism; they

believed that everything that happened and changed the earth was due to major catastrophes like violent volcano eruptions or meteorites from space impacting on the earth.

The dictionary definition is: “ Geology. The doctrine that certain vast geological changes in the earth’s history were caused by catastrophes rather than gradual evolutionary processes.”

### **Plates tectonic:**

Plates tectonic are the plates underneath the continents and are broken up into 7 major plates; the African, North American, South American, Eurasian, Australian, Antarctic, and Pacific plates. There are also some smaller plates, including the Arabian, Nazca, and Philippines plates. These plates are constantly moving at a rate of about 2-10cm per year. Some of the plates crash into each other while others simply follow each other or slip over and over each other. When the plates meet and are stuck together trying to move when one finally moves under the other it causes earthquakes and even tsunamis because one plate is thrust upwards causing the land above it to rise upwards.

### **Information about Earth Scientists:**

Sir Charles Lyell, James Hutton, Alfred Wegener and Harry Hess all have something very important in common; they helped form the theories, ideas and investigations of Plates tectonic, sea floor-spreading and the development of the theory uniformitarianism over catastrophism. The next paragraphs will introduce you to all of the above scientists, what they did

and how they did and also the meanings and importance of uniformitarianism and catastrophism.

## **James Hutton:**

### **Name:**

James Hutton

### **Nationality:**

Scottish

### **D. o. B:**

3 June 1726

### **D. o. D:**

26 March 1797

### **Speciality:**

Geologist, physician, naturalist, chemist and experimental farmer.

### **Brief insight:**

Known as the “founding father of modern geology”.

Started the theory of uniformitarianism

Influenced Sir Charles Lyell and Charles Darwin.

James Hutton was born in Edinburgh in 1726 and studied many things from farming to chemistry. He wrote the famous book “theory of the earth”, which gained the attention of many philosophers to come in later years and started the age of geology and new discoveries on how the earth works.

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Hutton's farming passion made him more susceptible to the beauty and wonders of the earth and as he began to examine rocks he discovered that in actual fact the earth didn't form around 6, 000 years ago as told by the catholic religion, but in actual fact over millions of years ago, and that fossils found were not the bones of animals that drowned in the great biblical flood. He pursued the idea that sedimentation (Sediment - mineral or organic matter deposited by water, air or ice. Sedimentation -the deposition or accumulation of sediment.), happens so slowly that " even the oldest rocks are made up of materials furnished from the ruins of former continents". He called these processes the " great geological cycle" which happens continuously.

## **Sir Charles Lyell:**

### **Name:**

Sir Charles Lyell

### **Nationality:**

British

### **D. o. B:**

14 November 1797

### **D. o. D:**

22 February 1875

### **Speciality:**

Geology

**Brief insight:**

He studied law and became a practising lawyer.

Wrote the “ Principles of Geology”, 1830, (12 editions), which basically made people accept the theory of uniformitarianism.

Without him Charles Darwin mightn't have been able to prove his theory of evolution.

Sir Charles Lyell was a British geologist and was the main person who gained recognition for the theory of uniformitarianism. It started off as an understanding and agreement for James Hutton's book “ theory of the earth”, but then turned into an adventure in proving uniformitarianism has and is at work. His observations led scientists to believe that slow, steady movements cause the earth to be shaped and formed, not catastrophic occurrences. Lyell's ability and flair for creative writing helped the theory become recognised by the world wide community of scientists. The information and evidence collected was enough to move the positions of the scientists and really show them flaws in the theory of catastrophism.

Without Lyell's clarification and dedication of explaining and proving uniformitarianism maybe Charles Darwin wouldn't have been able to progress his theories of evolution for people to believe and understand.

**Alfred Wegener:****Name:**

Alfred Wegener

**Nationality:**

German

**D. o. B:**

November 1, 1880

**D. o. D:**

November 1930

**Speciality:**

Astronomy and meteorology

**Brief insight:**

Lecturer of astronomy and meteorology at a German university.

Started to meddle with sciences outside his field.

Wrote an important paper called “ The origin of Continents and Oceans” which was the start of the theories on continental drift and plates tectonic.

Alfred Wegener was a German lecturer on astronomy and meteorology and this was his passion until he happened to come across a paper on the theory of a land bridge between Brazil and Africa. This made him try and understand the real reason for the jigsaw puzzle like continents that make up our world. Like many others he realised that Africa and South America seem to fit perfectly together and that there must have been a way for one species of fossil to be found in one country and another when the animal had a land locked form and the countries weren't connected.

His expeditions to Greenland (his most loved country to visit), led him to discover ' the discrepancies between the longitudinal calculations of his party and earlier ones from 1823 and 1870' this became an important part of evidence later on to prove that this particular continent has moved between the years therefore there must be evidence to suggest others have too. He later wrote a book/paper called " the origin of continents and continental drift", which was dismissed and mocked due to him being ' meddling out of his field of expertise' and his nationality as the Great War only ended to years earlier. None of the scientist wanted to believe that continents drifted and were once united as one, this was absurd. Wegener used many forms of evidence to back his theories sup such as the shared diamond mines between Brazil and Africa, even though they aren't connected, but the scientists refused to go back on what they believed in.

## **Harry Hess:**

### **Name:**

Harry Hess

### **Nationality:**

Canadian

### **D. o. B:**

May 24, 1906

### **D. o. D:**

August 25, 1969



**Speciality:**

Geology

**Brief insight:**

Single most important contribution of the 20th century.

Emphasised on the sea-floor spreading theory,

One of the “founding fathers” of plate’s tectonic theories.

Discovered the great global rift.

Harry Hess was a Canadian navy officer and specialised in geology he produced the original hypothesis of “the ocean floors were moving ‘like conveyor belts, carrying the continents along with them’. In his book “The history of ocean basins”, he quoted “The sea floor is not permanent, but is constantly being renewed. The mid-ocean ridge is indeed a crack in the crust. Through it hot material from the underlying mantle continually swells up and spreads outwards, new crust is generated at the rate of about half an inch a year on each side of the ridge.” His theories solved all problems of the time such as: The high heat flow along the ridge and the discovery of conical mountains on the sea floor. The understanding of sea-floor spreading also helped us to understand the theory of plates tectonic and how it works in comparison with sea floor spreading. But because this was only fiction and no solid evidence was produced to back up all statements of the theory it was taken the same way as Wegener’s thoughts...nowhere, until later on in the years.

## **Issues relating to the development of the theories of catastrophism and uniformitarianism:**

### **Religion vs. evidence:**

Catastrophism only remained in the heads of scientists due the direction in which it pointed - Noah's flood. Religion held a very high level of authority in the 1600's- late 1900's therefore everything that was discovered had to lead to a biblical explanation. It wasn't accepted until around 3 people tried to evolve the theory such as Hutton, Lyell and Darwin who all gave evidence and suggestions and add evidence on top of evidence to try and prove their way of thinking and the

### **Uniformitarianism vs. nature:**

After uniformitarianism was recognised as the higher of the two theories on how the earth was formed and is still shaping over catastrophism, everyone started to look at the events that were shaping the earth and began to see that uniformitarianism seemed to be the more appropriate theory. However as most scientists and the general public believe that uniformitarianism is the reasons for how the earth is what they're not realising is that catastrophism is also playing a part in forming the earth as well by natural disasters from violent volcano eruptions to tsunamis. These examples could happen at any given time and not much warning is given before hand of what is about to happen, therefore it could become a catastrophic occurrence which could shape the way the earth is. So catastrophism need not be forgotten.

## **Catastrophism vs. evidence:**

It is suggested that the cause of the extinction of the dinosaurs was due to a major meteorite impact which caused huge devastation for the earth and another theory is that they went extinct due to the great biblical flood, this theory is only on the basis on what the Bible says about the great flood, but in actual fact there is no evidence which suggests the dinosaurs drowned, just the word of the bible. The problem with catastrophism is that most the theories made up involving it don't show sufficient evidence to suggest it did happen besides the few cases of volcanoes erupting violently and changing the earth.

## **Conclusion:**

In conclusion to my report I support the theory of uniformitarianism because the evidence that backs it up is clear and concise and it has an answer to every problem e. g. how plates tectonic move and how volcanoes and mountains are made. But we shouldn't forget that catastrophism still works in ways when volcanoes and mountains and formed suddenly by earthquakes and tsunamis which change the earth.