

## Relative Dating Jigsaw Answers

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- 1. How old did humans think the Earth was prior to 1800? How did they obtain this value?**

Answers varied, Aristotle thought the Earth had existed eternally. Based on biblical accounts, Archbishop James Ussher of Ireland gave an origin date of 4004 B.C. In the 18<sup>th</sup> century, estimates were anywhere from 75,000 years old (Comte du Buffon), calculated by making a model of the composition of the earth and then measuring its cooling, to 2 billion years (Benoit de Maillet) by estimating how long it would take the sea to dissolve from where it had deposited the highest fossils.

John Phillips calculated 96 million years old by looking at the fossil record. Lomonsov estimated several hundred thousand years.

([https://en.wikipedia.org/wiki/Age\\_of\\_the\\_Earth](https://en.wikipedia.org/wiki/Age_of_the_Earth))

(<http://www.scientificamerican.com/article/how-science-figured-out-the-age-of-the-earth/>)

- 2. Explain James Hutton's Principle of Uniformitarianism?**

The same natural laws and processes that operate in the **universe** now have always operated in the universe in the past and apply everywhere in the universe. By studying these processes on Earth today, we can better understand the past. The landscape developed over long periods of time through a variety of slow cyclical geologic and geomorphic processes.

(<http://www.physicalgeography.net/fundamentals/10c.html>)

- 3. Lord Kelvin was an extremely influential scientist in the mid 1800's- what was his calculated age of the Earth? How was he proven wrong?**

Between 20 and 100 million years old. Models used to make calculations did not take into account plate tectonics.

(Lord Kelvin and the Age of the Earth, by Evelyn Lamb on June 26, 2013,

<http://blogs.scientificamerican.com/roots-of-unity/lord-kelvin-age-of-the-earth/>)

- 4. List the 6 Relative Dating Principles.**

- Principle of Superposition: in an undisturbed succession of sedimentary rock, the oldest layers are on the bottom and layers get younger as you go up

- Principle of Original Horizontality: due to the influence of gravity, all sediment is originally deposited horizontally.
- Principle of Lateral Continuity: similar layers of rock or sediment separated by a valley or other feature were once continuous.
- Principle of Cross-Cutting: any geologic feature that crosses other layers or rock must be younger than the material it cuts across.
- Principle of Inclusions: an inclusion must be younger than the rock it is included in. A younger object is within an older earth material.
- Principle of Fossil Succession: new sediment is deposited on top of older sediment and this is also true of the fossils within the sediment.
- (This Old Earth, Prof. Sean Tvelia, Suffolk County Community College, [http://www.thisoldearth.net/Geology\\_Online-1\\_Subchapters.cfm?Chapter=4&Row=2](http://www.thisoldearth.net/Geology_Online-1_Subchapters.cfm?Chapter=4&Row=2))

**5. What is an unconformity? How did unconformity provide Hutton with evidence for uniformity?**

An unconformity is a boundary within rock layers that is formed by erosion. Hutton observed an unconformity in Jedburg, Scotland. Since sediment is laid down horizontally, any angled sediment layers must have been lifted by a geologic process, and then covered by more horizontal sediment layers. This implied that this sediment and erosion was occurring over a much longer time period than previously imagined. It also implied that geological processes were cyclical: sediment, followed by erosion, followed by sediment. ([https://en.wikipedia.org/wiki/Hutton%27s\\_Unconformity](https://en.wikipedia.org/wiki/Hutton%27s_Unconformity)) ([http://evolution.berkeley.edu/evolibrary/article/history\\_12](http://evolution.berkeley.edu/evolibrary/article/history_12))

**6. What is the difference between the law of superposition and the law of cross-cutting relationships?**

The Law of Superposition is that layers of sediment are laid from oldest (on the bottom) and “the layers are progressively younger with ascending order in the sequence”. ([http://evolution.berkeley.edu/evolibrary/article/history\\_12](http://evolution.berkeley.edu/evolibrary/article/history_12)) whereas the Law of Cross-Cutting Relationships states that an event that cuts across existing rock is younger than that rock. ([http://www.geologyclass.org/evolution\\_concepts2.htm](http://www.geologyclass.org/evolution_concepts2.htm))