# Grade 12 Earth and Space Science

SES4U

Qinghao Hu

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# §1: Earth's Geological History

## §1.1 Cosmos Episode 7

1. What year for the beginning of the Earth did James Ussher give based on his study of the Bible?

- 23, October 4004 BC

2. What stable element does Uranium break down into after about 10 transformations?

- Lead

3. What happened to the rocks that were around at the birth of the Earth?

- Crushed, melted, and remade

4. What did Clare Patterson need to build before he could completely rule out lead contaminatoni in his sample?

- a new lab

5. What was the true age of the Earth found to be?

- 4.5 Billion Years old.

6. How did Clare Patterson conclude the oceans were being contaminated by lead gasoline?

- Lead is concentrated at surface not great depth = recent deposition.
- Amount of lead in ice and snow is much lower few hundred years ago. Before industrial revolution.

## §1.2 The Impossible Hugeness of Deep Time

### §1.2.1 Age of Earth

$4.54 \times 10^9$ years old / 4.54 Billion years old

### §1.2.2 Order of the Event

1. Formation of the Earth
2. Formation of Moon
3. Liquid water
4. Formation of Earth's atmosphere
5. First living organisms
6. Buildup of oxygen in atmosphere
7. First Eukaryotes
8. Formatoin of supercontinent Rodinia
9. Breakup of Rodinia
10. Early multicellular organisms
11. Cambrian explosion
12. First land plants
13. First amphibian, insect, tree, and shark fossils
14. First reptiles
15. Earliest flowering plants
16. Earliest birds and mammals
17. Early primates
18. Present day

## §1.3 Relative Age Dating

### §1.3.1 Principles

There are five principles can be used to identify rock's relative age.

**Principle of superposition**: In a sequence of undeformed sedimentary rocks, the oldest beds are on the bottom and the youngest are on top.

**Principle of original horizontality**: Sedimentary layers are horizontal, or nearly so, when originally deposited. Strata that are not horizontal have been deformed by movements of the Earth's crust.

**Principle of faunal succession**: Groups of fossil plants and animals occur in the geologic record in a definite and determinable order. A period of geologic time can be recognized by its respective fossils.

**Principle of crosscutting relations**: Geologic features, such as faults, and igenous intrusions are younger than the rocks they cut.

**Principle of inclusion**: a rock body that contains inclusions of preexisting rocks is younger that the rocks from which the inclusions came from.

$$N = N_0(\frac{1}{2})^{\frac{t}{t_{half}}} \tag{1.1}$$