

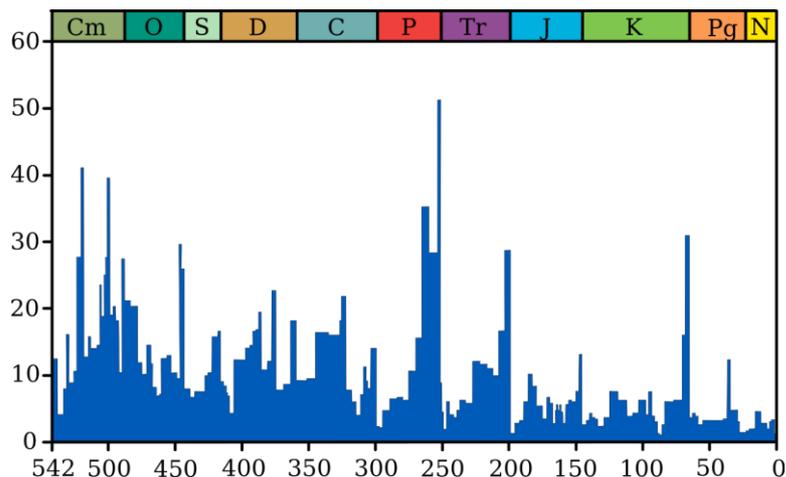


The Earth has existed since about 4.6 billion years when there was enough dust and gas to coalesce and form the planet. Life started about 3.6 billion years ago (note: this number is continuously challenged with new discoveries and improving technologies). We divide periods of time by major tectonic (Earth moving) events which took place and by significant changes in life forms present.

It is a general rule in sedimentary environments (The Principle of Superposition) that the rocks above are younger than the rocks below. Early geologists worked out local sequences of rock and then tried to correlate them with elsewhere. "The Map that changed the World" is a very readable book by Simon Chichester. It describes how William Smith, an early 1800s canal surveyor, created a map of southern Britain accompanied with notes on fossils found in each specific layer of rock. It was the first geological map.

Names given to major divisions in time and rock groups come from a variety of sources. Some are named after the area they were first reported, e.g., Devonian after the county of Devon in England, and some after their characteristic deposits, e.g., Carboniferous after the useful carbon rich coal deposits.

At several points during the history of life on this Earth, there have been mass extinctions. One example is the famous K-T Event (Cretaceous – Tertiary otherwise known as the K-Pg or Cretaceous-Paeogene extinction) about 66 million years ago. This was when some 75% of life perished, including dinosaurs, and quite different life forms evolved from those which survived. Luckily for us, mammals passed through the event and even benefited from the lack of competition afterwards.



Marine animal genera extinctions over time (Wikimedia Commons, [CC BY-SA 3.0](https://commons.wikimedia.org/wiki/File:Marine_animal_genera_extinctions_over_time.png))

Examination of an oil rig's drill core, from the sea floor just off the coast of Perth WA, has shown vibrant varied life forms and plenty of oxygen up to a thin dark band (the K-T event) and above the event almost nothing but dark grey mudstones.



The Geological Time Scale

Geologists study the form and sequence of rocks and fossils and have been able to infer the events which have occurred on Earth since its formation.

Generally,

The Cenozoic

was when mammals became dominant

The Mesozoic

was when reptiles (dinosaurs included) dominated

The Paleozoic

was when more complex sea dwelling plants and animals evolved and some moved onto the land

The Proterozoic

was dominated by very simple life forms

The Archaean

It used to be thought that no life existed at this time, but 3.45-billion-year-old stromatolites have been found at Marble Bar in WA in some of the oldest well preserved sedimentary rocks in the world. This time is significantly close to the stabilisation of the Earth's crust.

Geologists always start their descriptions from the bottom of a rock column and proceed upwards through to the younger rocks.

Students can be disenchanted if required to memorise the geological timescale. However, those who would enjoy the challenge might use the mnemonic:

Camels Ordinarily Sit Down Carefully Perhaps Their Joints Creak Possibly Early Oiling Might Prevent Painful Recurrence (note R is often H now – for Holocene)

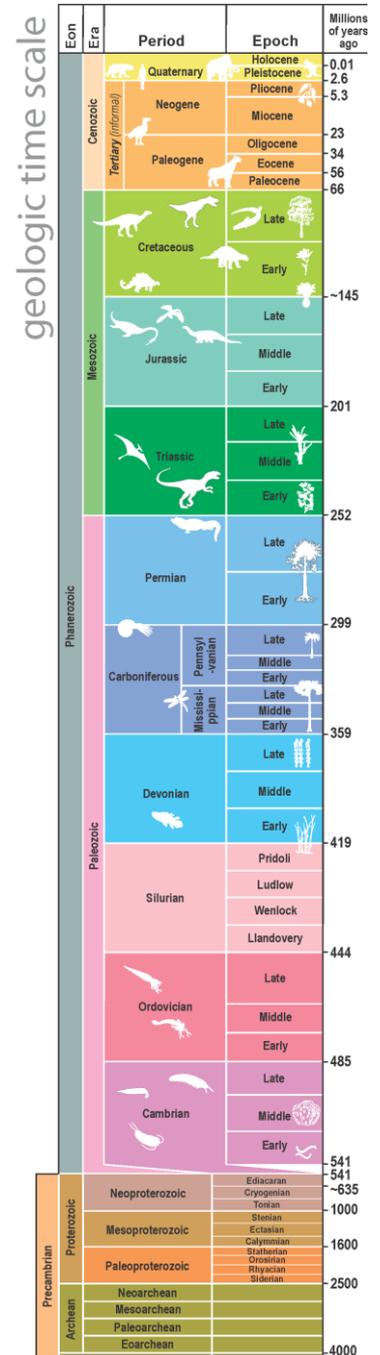
This assists in remembering the periods of the Paleozoic and Mesozoic eras and epochs of the Cenozoic era.

A good Australian poster of the geological time scale with information on continental drift and key fossils can be copied from this [link](#). Produced by Geoscience Australia and the Geological Society of Australia.

Some strata and fossils can cover a significant part of the Earth and can be used to correlate between remote outcrops. These reference strata are **"Index beds"** and may contain **"Index fossils"**.

Western Australia has an ancient core, the Yilgarn Craton, which has examples of the earliest rocks and the earliest life forms on Earth.

Hutton's Principle of Uniformitarianism states that "The present is the key to the past". Many of the processes shaping the Earth at present are the same as those which worked in the past. Rocks with similar features had similar creation processes.



Geological Timescale (Government of South Australia, [Department of Energy and Mining](#))



The rock on the left is sinter (siliceous slag) from a recent blast furnace in NSW. The rock on the right was spewed out in 1984 from a volcano in Iceland named Krafla. Both are silica rich, were full of gas when molten and were rapidly cooled at the Earth's surface. Large scale bedding seen in coastal dunes is similar to that demonstrated in the red Bassendean sands which are used by the construction industry in Perth. The Bassendean sands are about 240,000 years old.

Vocabulary

Geological Time Scale	A framework for deciphering the history of the Earth
Index fossils	Fossils from one geological age which allow correlation across a broad geographical area
Index beds	Geological strata specific to one age which allow correlation across a broad geographical area
Tectonic events	Deformation of the Earth's crust resulting in major movement events (E.g., mountain building)
Extinction events	Extinction of a large percentage of the Earth's species.

Suggested Lesson Sequence

Lesson 1: The geological time scale

- Discussion – How old is the Earth?
- Teacher demonstration - *Geological Timescale*
- Activity - *Personal timescale* - Students design their personal timescale and explain their choices for divisions

Lesson 2/3: Geological time estimation

- Discussion - The age of the Earth: the changing views of science
- Discussion - index beds, index fossils and age dating
- Activity - *Correlate the sediments*

Lesson 3/4: Paleotraveller

- Discussion - Recap Geological Time Scale
- Activity – *Paleotraveller* - Interactive trip through time in Australia

Lesson 4: Way Up!

- Discussion - Using superposition and grain size as indicators of way up
- Activity – *Way Up*



References

Cretaceous-Paleogene Extinction Event, accessed at https://en.wikipedia.org/wiki/Cretaceous%E2%80%93Paleogene_extinction_event, on 26 May 2021

Stromatolites and other early life, accessed at <http://www.dmp.wa.gov.au/Stromatolites-and-other-evidence-1666.aspx>, on 26 May 2021

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