

The origin of the Earth – at arm’s length

The age of the Earth – with a good stretch of imagination

Ask a student to volunteer for a fun way of imagining the age of the Earth – or take the part yourself. Explain that the Earth’s age may be represented to scale by the outstretched arms of a human being, where the fingertips on the person’s left side represents the origin of the Earth at approximately 4,500 Ma (millions of years ago). The fingertips on the right hand represent the present day. Calculate beforehand, or ask the students to do so, the intervals of every 500 million years. The arm span of the person in the photo below is 180cm, so the intervals from the tip of the right hand may be calculated by:

$$\frac{\text{Date} \times 180 \text{ cm}}{4500}$$

$$\text{e.g. } 500\text{Ma} = \frac{500 \times 180}{4500} = 20 \text{ cm}$$

Ma	Distance in cm
4500	180
4000	160
3500	140
3000	120
2500	100
2000	80
1500	60
1000	40
500	20
0	0

If the person is willing, ask a trusted student to mark these intervals on the bare arms of the volunteer with a water-soluble dry-wipe pen or choose another way of marking them out, e.g. with a loop of string hung on the arms and sticky Post-it™ notes across the chest. Ask the rest of the class to say where they think the following events should be placed along the “arm’s length time scale” and indicate with felt tipped pen or Post-it™ notes where most people think they should go.

List (not in order)

- first flowering plants
- solidification of the Earth’s crust
- first humans
- extinction of the dinosaurs
- first evidence of life on Earth
- first land animals
- first animals with hard parts

Unless the students are already familiar with the time scale, it is likely that they will place most of the events at far too old a date, and the exercise below may be used to show just how much of the history of life on our planet is crammed into the last 500 Ma (See **Following up the activity** below).



The volunteer, duly marked up at 500Ma intervals (Photo: P. Kennett)

The back up

Title: The origin of the Earth – at arm’s length.

Subtitle: The age of the Earth – with a good stretch of imagination.

Topic: A “fun” way of teaching the great length of geological time. This activity could be used to reinforce other methods of helping pupils to understand the concept of “deep time”, e.g. during a quick- fire revision session.

Age range of pupils: 8 -18 years

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- describe key events during geological time;
- put these in the correct order;
- give an idea of the extent of geological time and that key events happened mainly in the past 500 million years;
- explain that modern humans appeared very recently in geological terms.

Context: The following table shows some commonly accepted dates, at the time of publication in 2022, in order of age, with the calculation of the distance along the volunteer's arms for marking them. The advances in microscopy mean that more ancient fossils are identified, so pushing back the dates of their first appearance.

Event	Date before present (Ma)	Distance from right fingertips cm
solidification of the Earth's crust	4300	172.0
first evidence of life on Earth	3500	140.0
first animals with hard parts	545	21.8
first land animals	400	16.8
first flowering plants	130	5.2
extinction of the dinosaurs	66	2.6
first "humans"	3	0.1

Following up the activity:



A hand marked up in 100Ma intervals for the addition of key events (Photo: P. Kennett)

Ask students to place the events of the last 500 Ma from the first activity onto their own hands, using a water-soluble dry-wipe pen, and assuming that the position of their wrists represents 500 Ma. On this scale, the whole of modern human existence (*Homo sapiens sapiens*) is shown by no more than the dirt on their fingers. Imagine what would happen to humankind if they were to wash their hands! Students may wish to go home unwashed and impress their parents – or not, as the case may be!).

For those who wish to provide more detailed information, the diagram on page 3 may be used to show the evolution of more major groups of organisms, including two of the major episodes of extinction.

Underlying principles:

- Geological time is the length of time for which the Earth and the solar system have existed and is approximately 4.5 billion years long (actually around 4567 Ma).
- A number of key events have occurred during geological time, and those affecting life on Earth have mostly occurred only relatively recently in geological time.

Thinking skill development:

Understanding the duration of geological time and the timing of key events requires the development of skills of thinking in the time dimension.

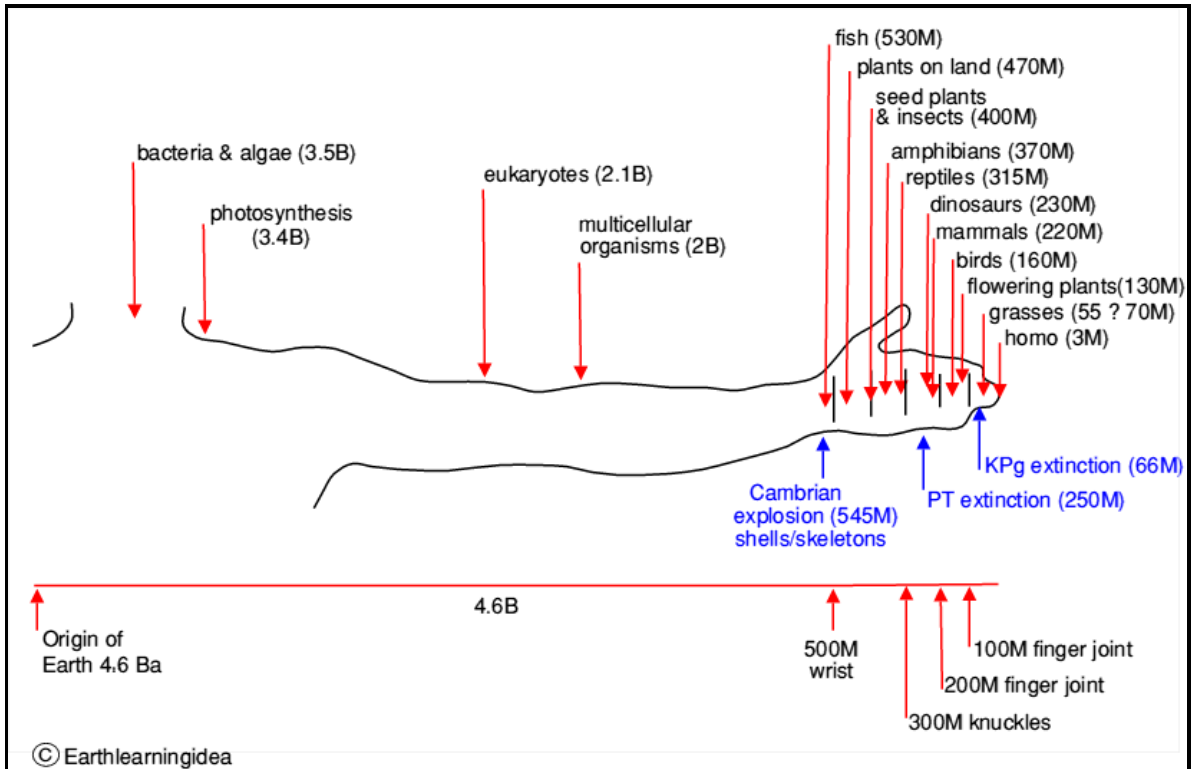
Resource list: A willing volunteer!

- water-soluble dry-wipe pen
- sticky notes e.g. Post-it™

Useful links:

- http://www.earthlearningidea.com/PDF/Washing_line_time.pdf
- https://www.earthlearningidea.com/PDF/234_T_oilet_roll_of_time.pdf

Source: Written by the Earthlearningidea team, based on an idea by Little, Richard D., *Dinosaurs, Dunes, and Drifting Continents*. Greenfield, Mass: Valley Geology Publications, 1984, p 5.



The evolution of some major groups of organisms, scaled to fit an outstretched arm

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