

‘Looking so far into the Abyss of Time’ How to visualise the immensity of geological time...with a rope!

“On us who saw these phenomena for the first time, the impression made will not easily be forgotten,” wrote John Playfair, one of James Hutton’s companions on his historical boat trip to Siccar Point on the Berwickshire coast in 1788. On that day Hutton was able to use field evidence to convince his colleagues of the immensity of geological time. (Fig 1). John Playfair further remarked, “The mind seemed to grow giddy by looking so far into the abyss of time.”



Fig.1 – The Siccar Point Unconformity. (Pete Loader)

Since that day most students, like Playfair, have often found it difficult to imagine the concept of ‘Deep Time’, particularly without meaningful reference points to help. This ELI, one of a number outlined below, is an attempt to help them visualise geological time at different meaningful scales with relevant points of reference.

Method

Stretch a length of rope between two chairs/persons (about 10 metres apart) and select between 5 - 10 volunteers (depending on the class size) who have a good range of ages and months in which their birthday falls. (Fig 2). Explain that the rope represents just one year of geological time with one end representing 31st December and the other the previous 1st January of that year. Distance along the rope can then be roughly estimated as the 365 days of the year.

- Ask the volunteers to arrange themselves roughly according to their birthday and hold onto the rope in the approximate position of this date. This is a good exercise when used as an ice breaker. (Fig 2 - photo1).

The volunteers and the onlooking class are then invited to note the result. – *a roughly even distribution throughout the year*. The teacher then points out that the length of the year can be visualised in this way when punctuated by significant personal events (e.g., birthdays, anniversaries etc).

- Ask them to discuss what other events we might use to divide up a calendar year? – *seasons, phases of the moon, length of day/night etc.*



Photo 1
1 yr. scale

Photo 2
100 yr. scale

Photo 3
1000 yr. + scale

Fig. 2 – The Abyss of Time, in action. (Peter Williams)

Next, ask the volunteers to reposition themselves if the length of rope now represents 100 years. With a school class the teacher, or other adults, might need to be included in this for effect though it works well with a mixed group of adults. (Fig 2 - photo 2).

- Ask the group what the impact is of changing the scale in this way – *depending on the age range bunching up at one end with less representation further into the past.*
- Ask them to discuss what other events we might also use to divide up a century? – *world wars, significant specific sporting events, the moon landing, major national/world disasters (9/11) etc.*

Then suggest the scale is changed again with the rope now representing 1000 years. What effect will this have on the distribution of people? – *everyone will be trying to hold onto the very tip of the rope with the rest completely unrepresented.* (Fig 2 - photo 3)

- Ask them to discuss what other reference events we might use to divide up the 1000 years – *e.g., Magna Carta in England, Galileo scientific discoveries in Italy etc.*

Finally state that the rope represents not 1000s but millions and even billions of years (indeed the age of the Earth at 4.54 billion years)?

- Ask why it is easier to visualise time when dealing with less than 100 years? - *human lifespan is limited to <100 years.*

- How might such a vast period be divided to be meaningful to humans? – *it would need specific geological events, evident in the rock record, as well as fossils where they can be found.*
- Ask students to research and record some of these common reference points in the rock record that might be used.
- Students might empathise further with geological time scales and the 'Abyss of Time' by now completing the two ELIs, 'Toilet Roll of Time' and 'Washing Line of Time', referenced in 'Useful Links'.

The back up

Title: 'Looking so far into the Abyss of Time'

Subtitle: How to visualise the immensity of geological time...with a rope!

Topic: An exercise to demonstrate the extent of geological time-scales and the need for meaningful geological reference points, obtained from fossils and other geological events, recorded in the rock record.

Age range of pupils: 10 – 18 years

Time needed to complete activity: 10 minutes (plus research time)

Pupil learning outcomes: Pupils can:

- appreciate the great length of the timescales associated with 'Deep Time';
- understand that geological time scales are only relevant when illustrated by meaningful reference points;
- explain that geological events preserved in the rock record, as well as the fossil record, enable the relative timescales to be understood;
- appreciate that key events happened mainly in the past 600 million years and that further back in time our reference points are limited;
- explain that humans appeared very recently in geological terms.

Context:

This activity has been devised to address the difficulty of appreciating the extent of geological time. Research has shown that many people struggle with the idea of the great lengths involved with geological time or of the order of key events during the geological history of the Earth.

Following up the activity: Use the internet to research the dates and order of key events during the Phanerozoic and Precambrian. Complete two further ELI's – 'Washing line of Time' and 'Toilet Roll of Time' (See useful links below).

Underlying principles:

- Geological time is the length of time for which the Earth and the solar system have existed and is around 4.6 billion years long.
- Geological time at different meaningful scales can only be relevant when studied with geological events or fossil points of reference.
- 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 fourth dimension.

Resource list:

- length of rope appropriate to the presentation space and number of volunteers.
- volunteers with a range of birth months and preferably ages.

Useful links:

https://www.earthlearningidea.com/PDF/Washing_line_time.pdf
[https://www.earthlearningidea.com/PDF/234 Toilet roll of time.pdf](https://www.earthlearningidea.com/PDF/234_Toilet_roll_of_time.pdf)
[https://www.earthlearningidea.com/PDF/93 James Hutton.pdf](https://www.earthlearningidea.com/PDF/93_James_Hutton.pdf)
[https://www.earthlearningidea.com/PDF/261 Filling the gap.pdf](https://www.earthlearningidea.com/PDF/261_Filling_the_gap.pdf)

Source: Based on an idea by Alexandru Andrasanu (a Romanian geoscientist) and written by Pete Loader of the Earth Learning Idea Team.

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