The washing line of time

Activity:
This is a practical activity which involves sorting and hanging pictures representing important evolutionary events on the ‘washing line of time’.

- Students are told that the washing line represents the 4600 million years since the Earth was formed, and are told which end represents the origin of the Earth.
- Ask students to first put the events in the order they think they occurred.
- Next, students peg the events on the line in the position of the time that they think the events happened, and record their answers.
- Students are shown a correct, completed washing line – and are asked, ‘How does it compare with yours?’

The table below provides dates and distances for a 4.6 metre washing line (1 million years = 1 mm).

<table>
<thead>
<tr>
<th>Event</th>
<th>Millions of years ago (Ma)</th>
<th>Distance from ‘present day’ (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First humans (genus Homo)</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>First grasses</td>
<td>55</td>
<td>5.5</td>
</tr>
<tr>
<td>K-T boundary mass extinction</td>
<td>65</td>
<td>6.5</td>
</tr>
<tr>
<td>First flowering plants</td>
<td>130</td>
<td>13</td>
</tr>
<tr>
<td>First birds</td>
<td>150</td>
<td>15</td>
</tr>
<tr>
<td>First mammals</td>
<td>220</td>
<td>22</td>
</tr>
<tr>
<td>First dinosaurs</td>
<td>225</td>
<td>22.5</td>
</tr>
<tr>
<td>The ‘Great Dying’ mass extinction</td>
<td>251</td>
<td>25.1</td>
</tr>
<tr>
<td>First reptiles</td>
<td>325</td>
<td>32.5</td>
</tr>
<tr>
<td>First plants with seeds</td>
<td>360</td>
<td>36</td>
</tr>
<tr>
<td>First amphibians</td>
<td>360</td>
<td>36</td>
</tr>
<tr>
<td>First plants and animals on land</td>
<td>420</td>
<td>42</td>
</tr>
<tr>
<td>First animals with hard parts</td>
<td>545</td>
<td>54.5</td>
</tr>
<tr>
<td>First multicellular organisms</td>
<td>1200</td>
<td>120</td>
</tr>
<tr>
<td>First eukaryotes</td>
<td>2000</td>
<td>200</td>
</tr>
<tr>
<td>First bacteria</td>
<td>3500</td>
<td>350</td>
</tr>
<tr>
<td>The origin of the Earth</td>
<td>4600</td>
<td>460</td>
</tr>
</tbody>
</table>

Student learning outcomes:
Students will be able to:
- describe, in general terms, the history of life on Earth;
- explain the enormity of the timescale in which evolution operates;
- recall that humans appear only very recently in geological terms.

Student practical or teacher demonstration:
Student practical.

Time needed to complete the activity:
20 minutes.

Preparation and set-up time:
5-10 minutes to set up the 4.6 metre long ‘washing line’.

Resources:
- Sixteen laminated pictures of organisms, each representing an important event in the history of life:
  - First bacteria (cells without a nucleus)
  - First eukaryotes (cells with a nucleus)
  - First multicellular organisms
  - First animals with hard parts (e.g. a trilobite)
  - First plants and animals on land (e.g. early arthropods and land plants from Rhynie Chert)
  - First amphibians (e.g. Icthyostega)
  - First plants with seeds
  - First reptiles (e.g. Hylonomus)
  - First dinosaurs (e.g. Thecodontosaurus)
  - The ‘Great Dying’ mass extinction
  - First mammals (e.g. Morganucodon)
  - First birds (e.g. Iberomesornis romerali)
  - First flowering plants (e.g. Archaefructus)
  - The K-T boundary mass extinction
  - First grasses
  - First human (genus Homo)
- A laminated card labelled “Origin of the Earth”
- Laminated instruction sheet
- 5 metre length of string (allows 0.4m for fixing at each end)
- Metre ruler or tape measure
- 17 clothes pegs to attach cards to washing line
- Drawing pins/clips to attach string to the wall

Ideas for leading into the activity:
There are lots of ways of introducing the concept of ‘deep time’ (the geological timescale), for example, using marked up rolls of wallpaper, the 24 hours of the day, or even a toilet roll.

Ideas for following up the activity:
Ask students to consider:
- Which events were difficult to place on the timeline?
- What can they say about the order in which the events occurred? Is it surprising?
- Humans have existed for 2 million years, while bacteria have been around for 3500 million years. Will either still be around 3500 million years from now?

Extension ideas for more able of faster pupils:
The evidence from the fossil record used in this activity can be compared to the dating for events provided by ‘molecular clocks’ when DNA sequences are compared. Why might the date for the first eukaryote in the fossil record be much later than the date calculated using DNA sequences? The fossil record is incomplete - and small organisms without hard parts are the least likely to be preserved – so it extremely unlikely that we will ever find the very first fossil of anything. Alternatively, the molecular clock used may be wrong.
The washing line of time

You are provided with a set of sixteen cards representing various organisms that have appeared on the Earth or become extinct throughout geological time, plus an ‘Origin of the Earth’ card.

1. Try to place the cards on the bench in the order in which you think each organism first appeared on Earth (so far as we can tell from the fossil record); then add the ‘extinction’ cards.

2. Fix up a piece of string 4.6m long, to represent the 4600 million years since the Earth was formed (i.e. 1 metre to 1000 million years).

3. Peg the ‘Origin of the Earth’ card at one end of the string.

4. Peg the picture cards where you think they belong on the line.

Origin of the Earth

First bacteria
(cells without a nucleus)
First eukaryotes (cells with a nucleus)

First multicellular organisms

First animals with hard parts

First plants and animals on land
First amphibians

First plants with seeds

First reptiles

First dinosaurs
The ‘Great Dying’
mass extinction

First mammals

First birds

First flowering plants
KS4 Workshops

Life, the Atmosphere & Everything

-K/T boundary
mass extinction

First grasses

First human

Source of images:
- First bacteria, scanning electron micrograph of *Escherichia coli* – by NAIAD, this image is in the public domain
- First eukaryotes, *Saccharomyces cerevisiae* cells in DIC microscopy - by Masur, this image is in the public domain
- First multicellular organisms, Stromatolites at Lake Thetis, Western Australia - © Ruth Ellison (http://www.ruthellison.com/)
- First plants and animals on land, top image is *Cooksonia pertoni* - © Smith609, bottom image is *Dendrerpeton* - by Haplochromis, this image is in the public domain
- First amphibians, model of *Ichthyostega* - © Dr. Günter Bechly
- First plants with seeds, fruiting twig of *Ginkgo biloba* - © IMC
- First dinosaurs, *Coelophysis* animatronics model – photo created by Ballista – image edited by Firsfron
- The ‘Great, Dying’ mass extinction, top image is an *Archaeothyris* - © ArthurWeasley, bottom image is an *Aenigmoceras rhiaeum* - © Apokryftarios
- First bird, *Iberomesornis romerali* - by Locutus Borg, this image is in the public domain
- First flowering plants *Amborella trichopoda* - © Scott Zona
- K/T boundary mass extinction, top image is a *Douvilleiceras mammilatum* - © Apokryftarios, bottom image is a *Styracosaurus* - by LadyofHats, this image is in the public domain
- First grasses, - by D.Herman, this image is in the public domain
- First humans - © Gunkarta Gunawan Kartapranata