Geologic Time Scale

Introduction

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A Scaled Timeline

- A timeline places events in chronological order
- A scaled timeline uses measurements on the line to accurately depict when the event occurred in relation to the size of the line
- Let's practice: If this line represents the months of a year, where would we put today's date?

January 1 December 31

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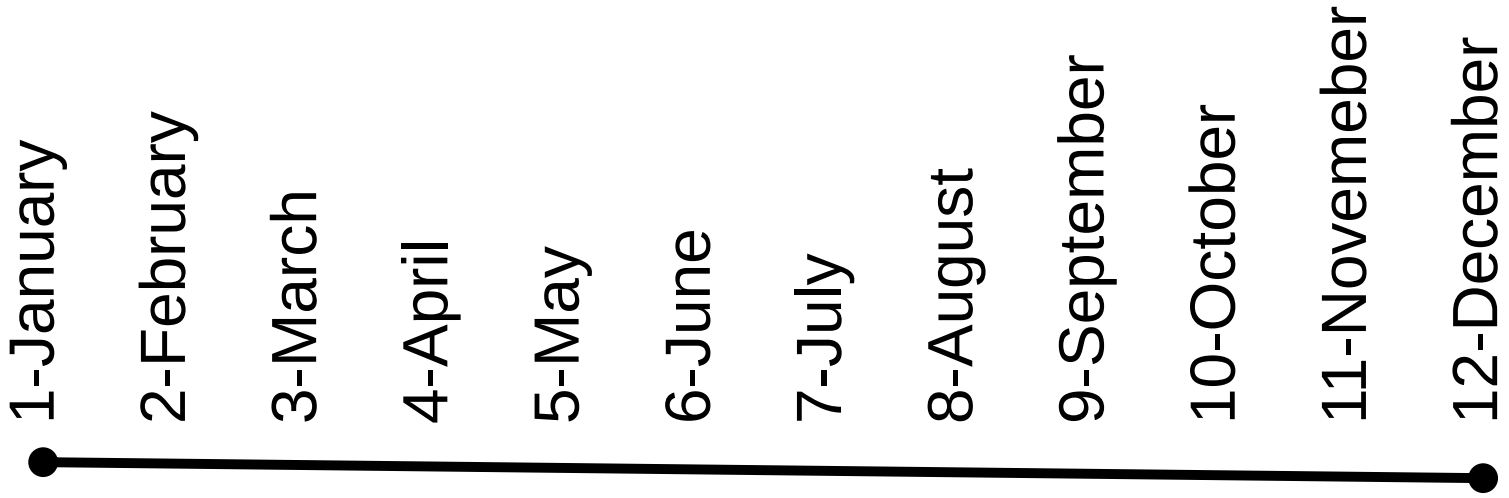
A Scaled Timeline

- If this line represents the months of a year, where would you put your birthday?



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Earth's History

- The Earth formed about 4.6 billion years old
  - **That's 4,600,000,000 years of geologic time**
- When do you think we, humans, show up in Earth's history?

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Humans are very recent!

- *Homo sapiens* show up in just the last half a million years of Earth's history

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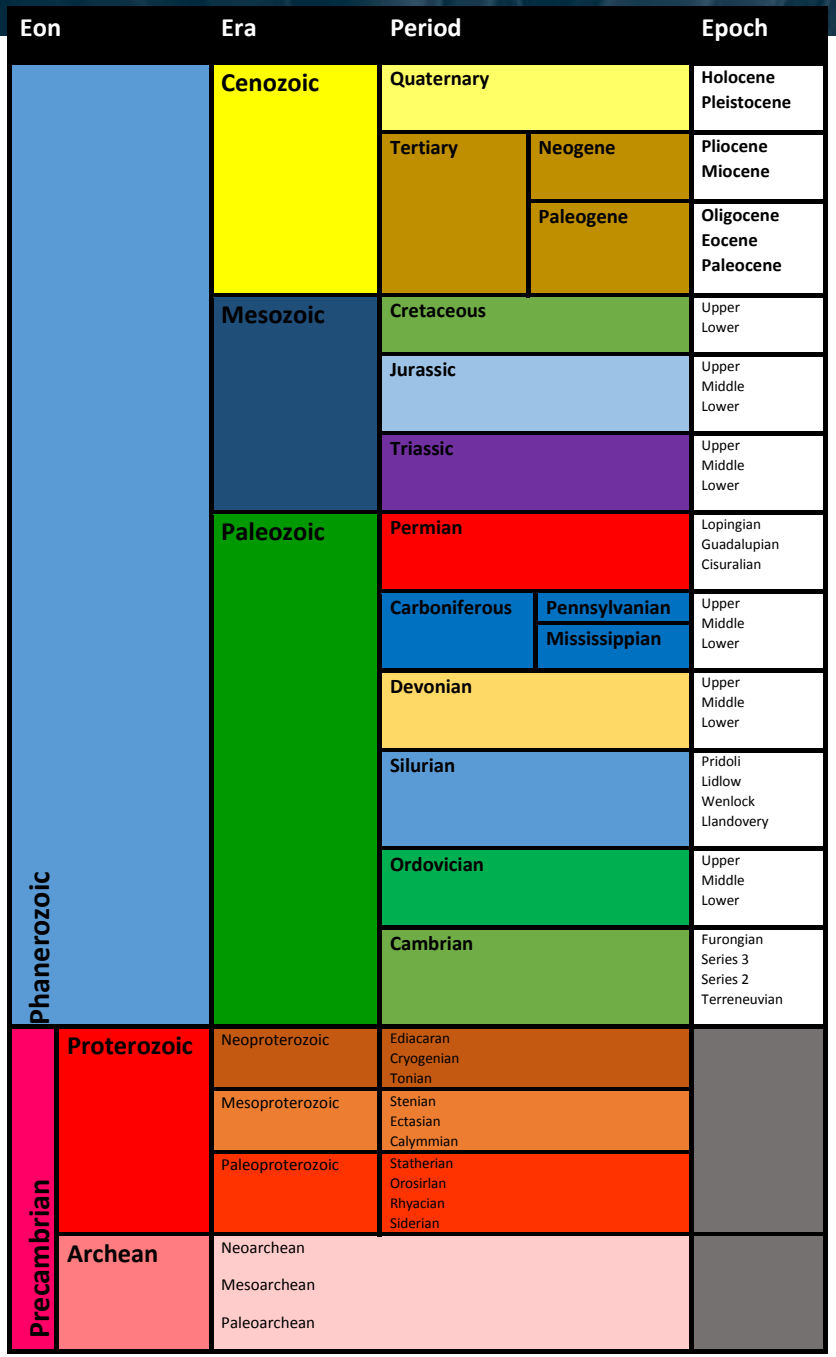
Earth's History

- 4.6 Billion years old
  - **It's such a long period of time that its difficult to talk about in years**
  - **We break up time into different parts so that we can understand them**
    - Just like we break up time into years, months, weeks, days, hours, minutes, and seconds…
    - Earth's history is broken up into Eons, Eras, Periods, Epochs



Earth's History

- The Geologic Time Scale is broken into the following:
  - **Eons**
    - Eras
      - Periods
        - Epochs

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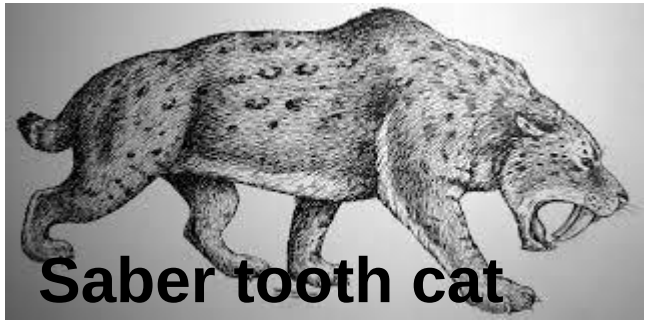
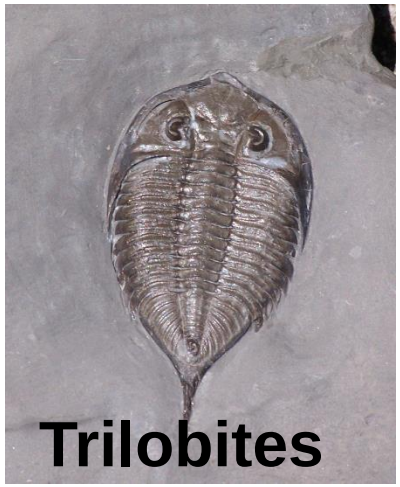
Predict: Can you put these in order of oldest to most recent?





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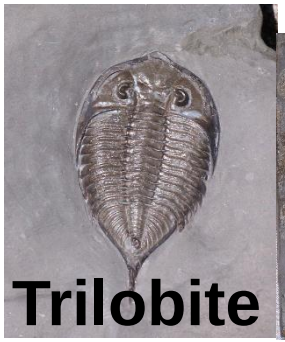
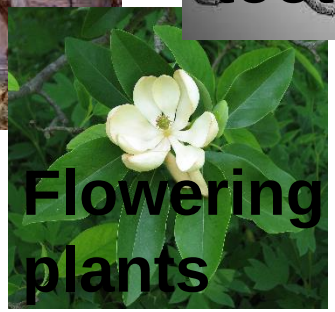
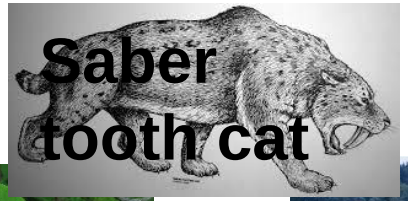
Can you put these in order of oldest to most recent?

Answers:







Oldest to most recent →

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Geologic Time Scale Activity

- Let's make a scaled timeline of Earth History!
- 4.6 billion years ago (BYA) to the present using a rope
  - **1 ft = 100 million years**
  - **10 ft = 1 billion years**
  - **So…how many feet of rope do we need?**
- Now lay the rope out in your classroom for the next part of the activity

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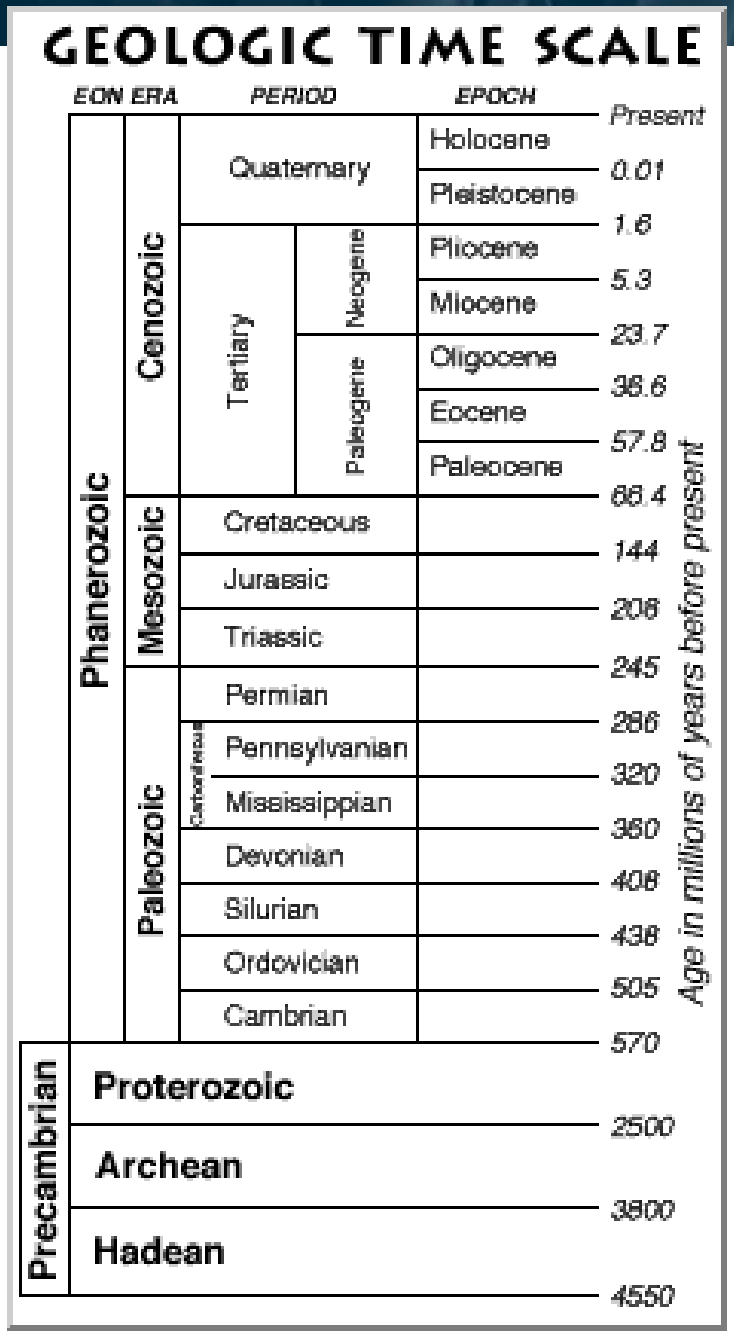
The Earth did not always look the way that we see it today.



- Students: research the Eon, Era or Period in time that you are given by your teacher.
- Once you are done, let's build the Earth's timeline

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Teacher slide

- The next several slides can be used during this activity as the class builds Earth's history timeline!

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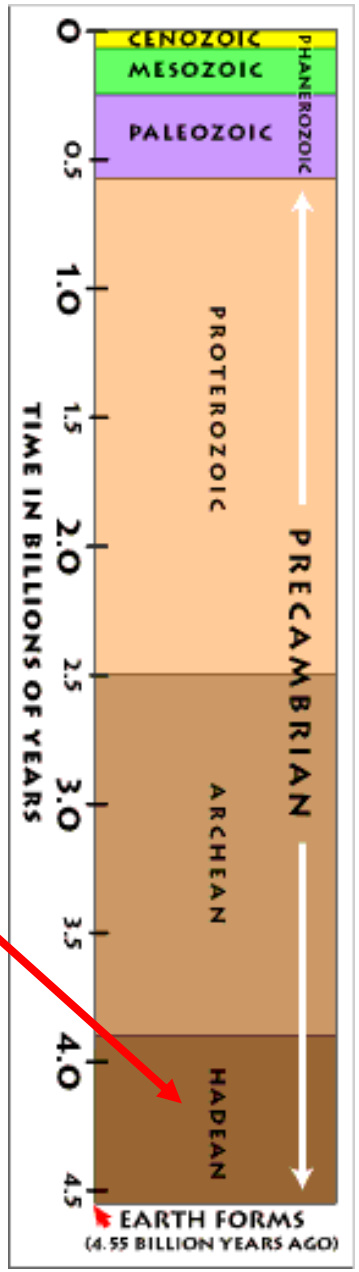
PreCambrian SuperEon

(4.6 BYA – 541 MYA)

- Proterozoic Eon (2.5 BYA – 541 MYA)
- Archaean Eon (4 BYA – 2.5 BYA)
- **Hadean Eon (4.6 BYA - 4 BYA)**

The Acasta gneiss is one of the oldest rocks on Earth dating 4.03 billion years..



http://ocean.si.edu/slideshow/ocean-throughout-geologic-time-image-gallery

PreCambrian SuperEon

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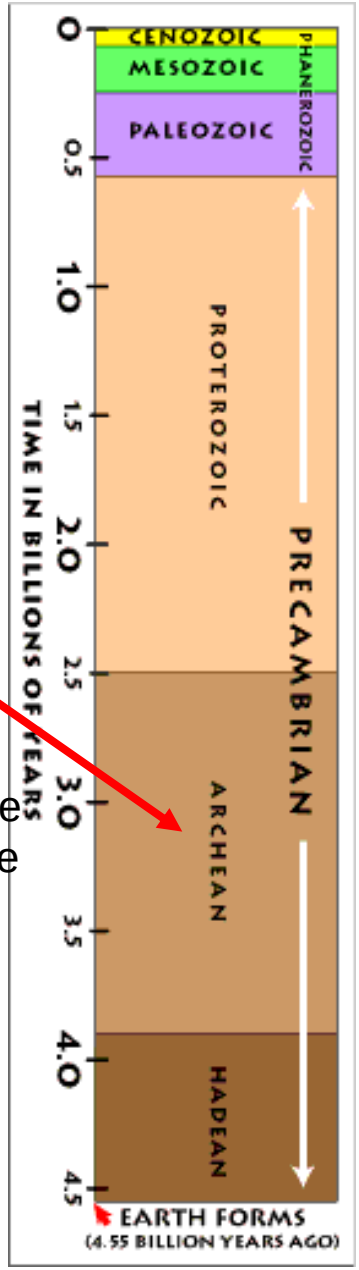
Stromatolite fossil image

Banded iron formations from the late Archaean and early Proterozoic eons



PreCambrian SuperEon

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- Archaean Eon (4 BYA – 2.5 BYA)
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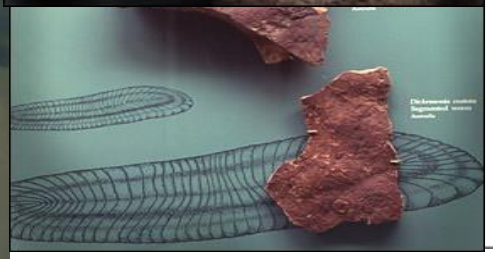
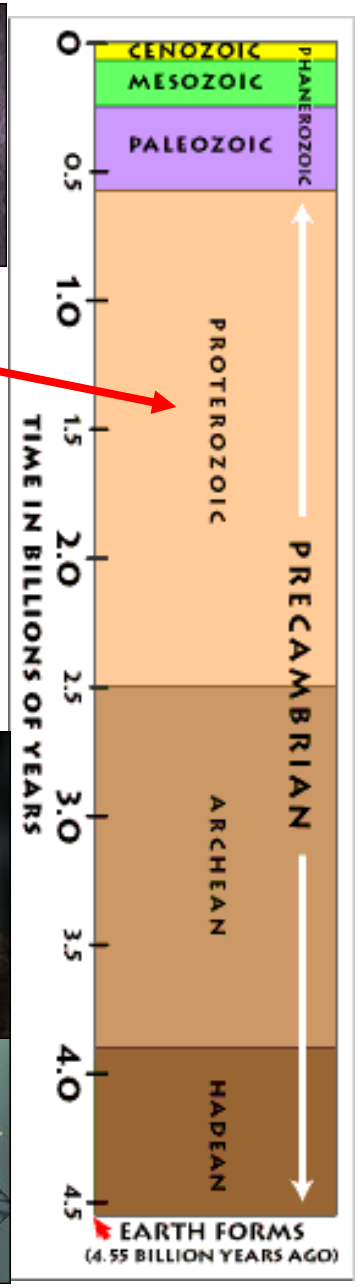
Sea Pen, Jellyfish, & Segmented worm fossils from end of Proterozoic Eon

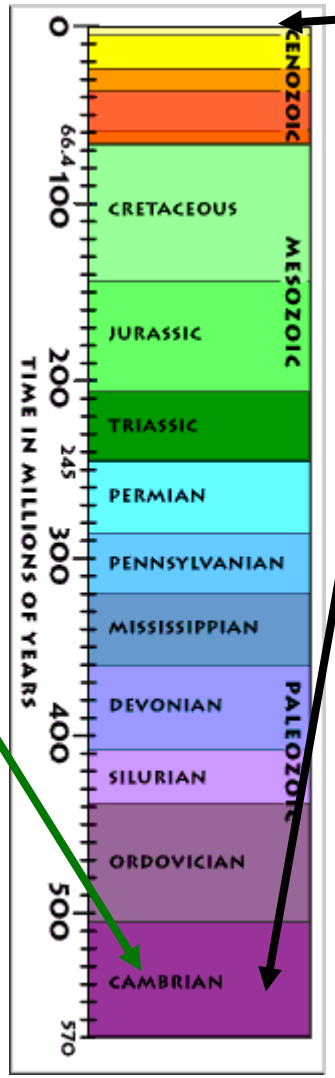


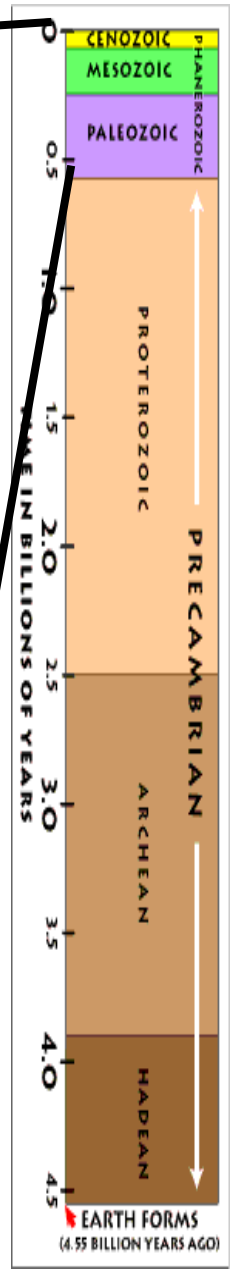


Phanerozoic Eon: Paleozoic Era

(541 MYA – 252.17 MYA)

- Permian Period (298.9 MYA - 252.17 MYA)
- Carboniferous Period (358.9 MYA – 298.9 MYA)
- Devonian Period (419.2 MYA – 358.9 MYA)
- Silurian Period (443.8 MYA – 419.2 MYA)
- Ordovician Period (485.4 MYA – 443.8 MYA)
- **Cambrian Period (541 MYA – 485.4 MYA)**





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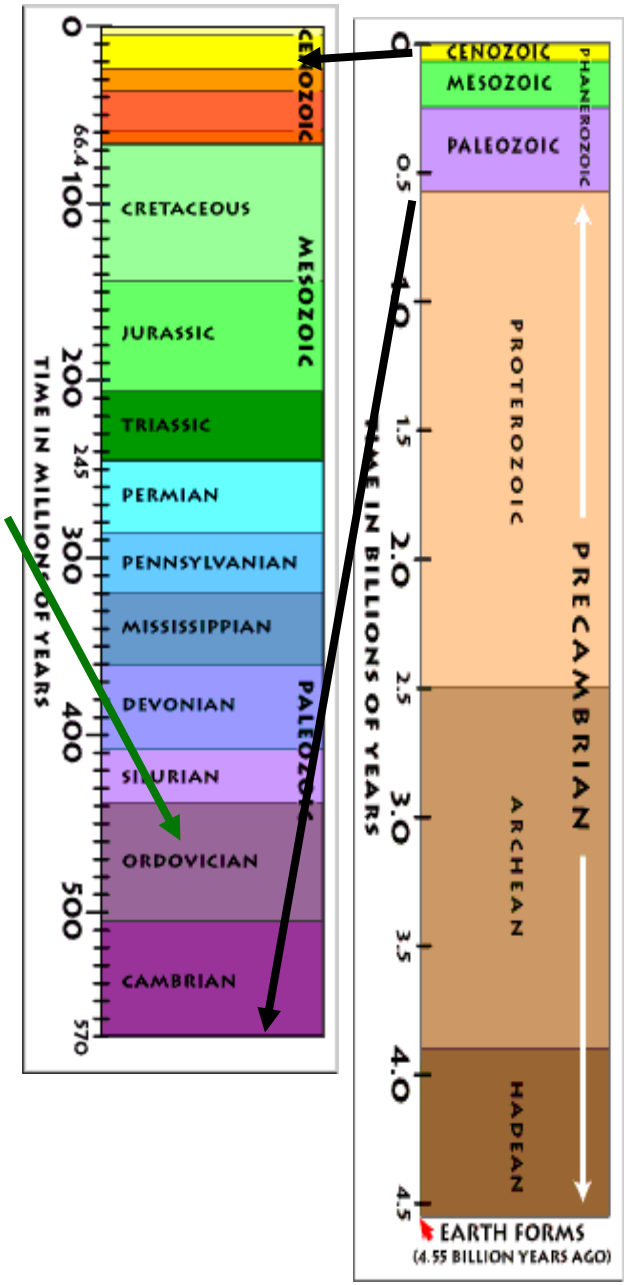

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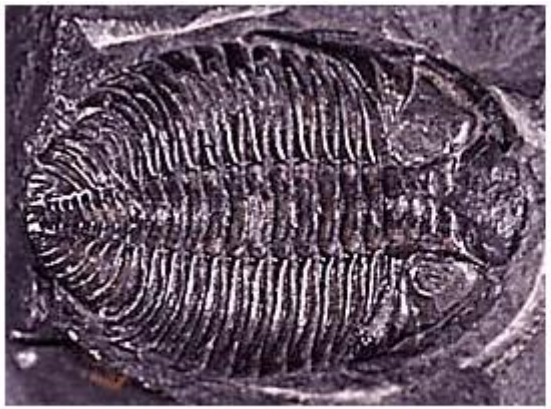
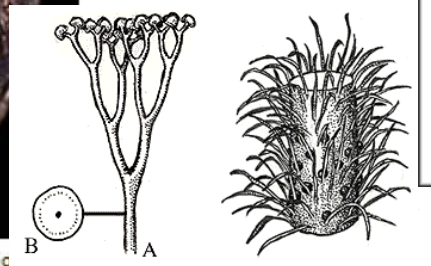
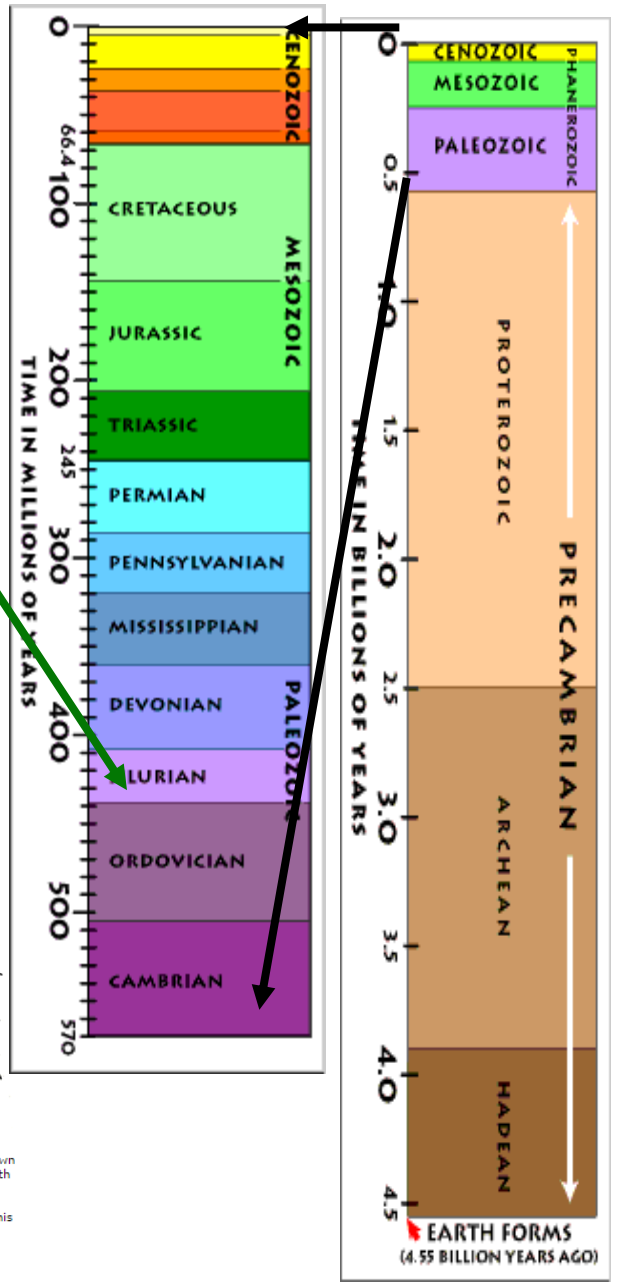


On the left, *Dalmanites limuluris*, a trilobite from the Silurian of New York. To the rig
Grammysia cingulata, a brachiopod from the Upper Ludlow of England.



Cooksonia, on the left, has usually been considered the oldest known land plant. Fossils assigned to several species are known from North America, Europe, Asia, and Africa, and from both the Late Silurian and Early Devonian. The lycophyte *Baragwanathia*, on the right, is structurally more complex than *Cooksonia*, but Silurian fossils of this plant have been found in Australia, significantly earlier than in the Northern Hemisphere.



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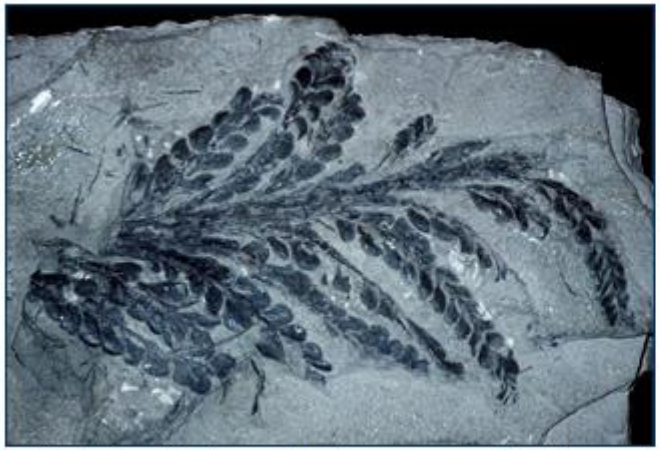
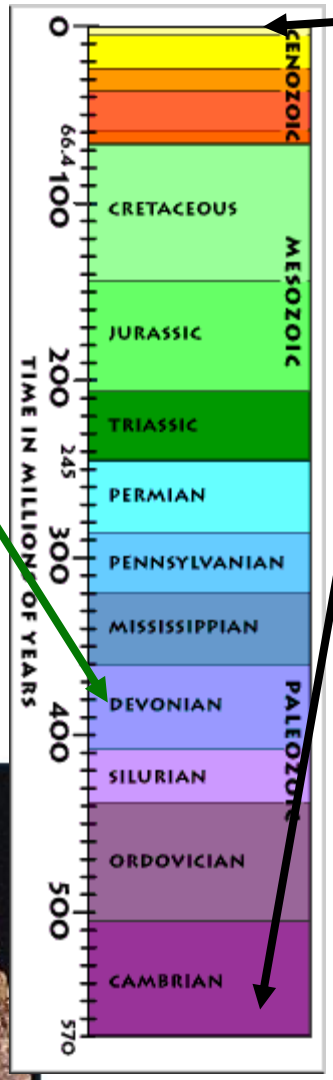
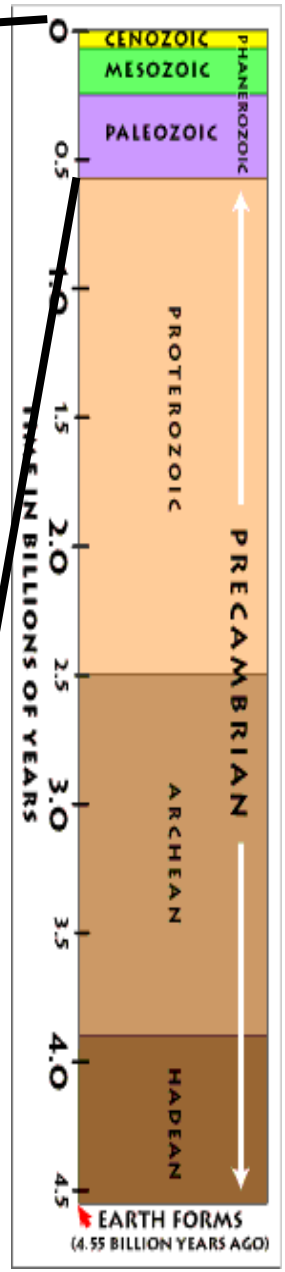


At left, the fern-like leaves of *Archaeopteris*, one of the first tree-like plants. It grew to an average height of about 10 meters, produced spores, and had a global distribution. At right, a beautifully pyritized Devonian brachiopod, *Paraspirifer bownockeri*, from Ohio.





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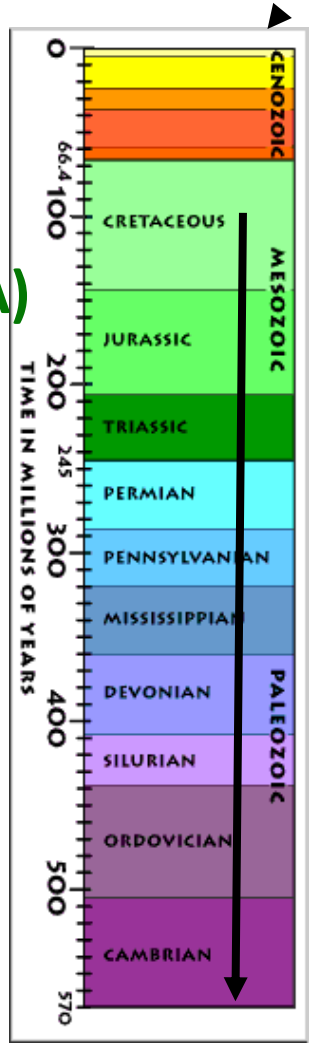

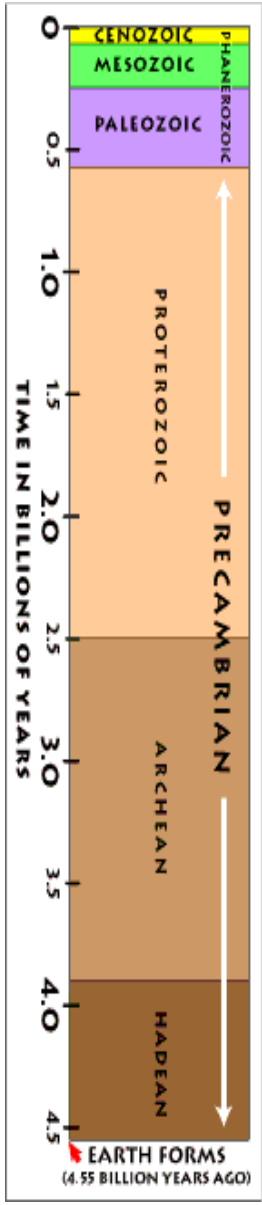

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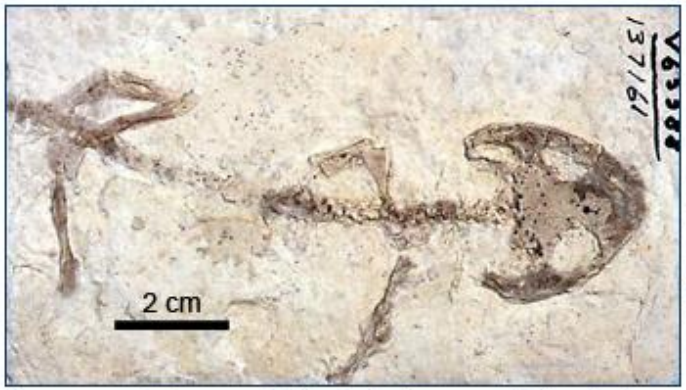
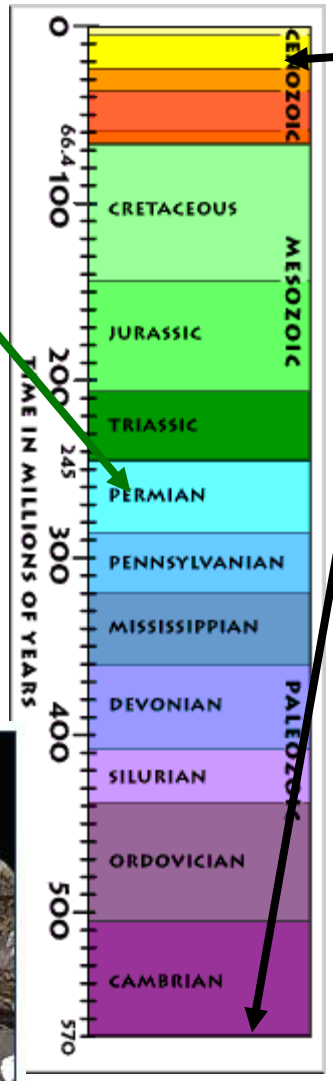
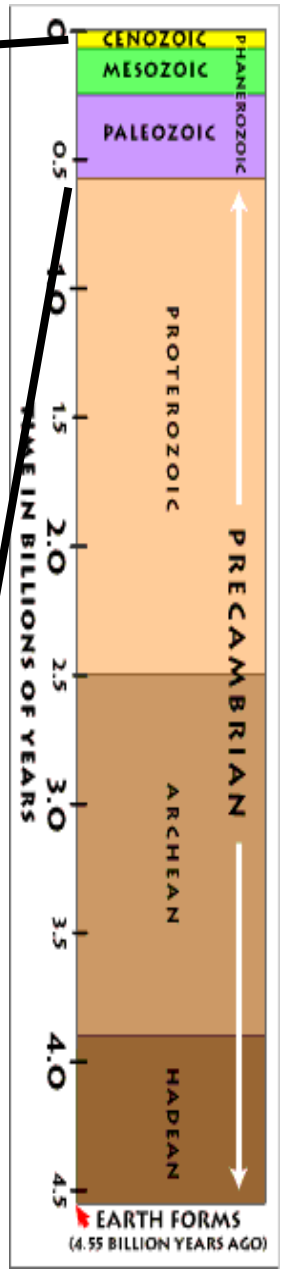


Many groups that appeared in the Carboniferous would give rise to groups that dominated the Permian and Mesozoic. On the left is *Amphibiamus lyelli*, an early temnospondyl. These amphibian-like early tetrapods grew to the size of crocodiles in the Permian and Triassic. On the right, *Lebachia*, an early relative of the conifers.

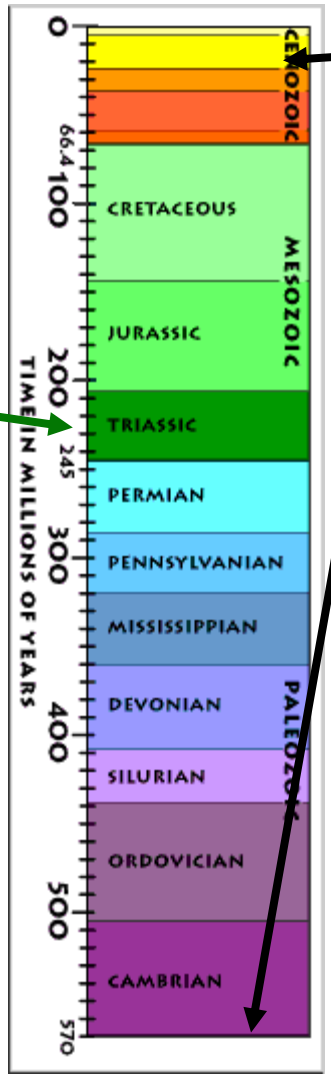


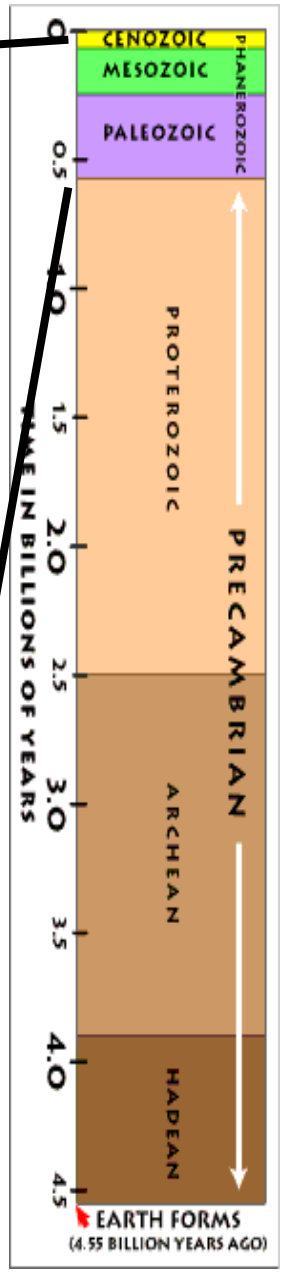


Phanerozoic Eon: Mesozoic Era

(252.17 MYA – 66 MYA)

- Cretaceous Period (145 MYA - 66 MYA)
- Jurassic Period (201.3 MYA – 145 MYA)
- **Triassic Period (252.17 MYA – 201.3 MYA)**





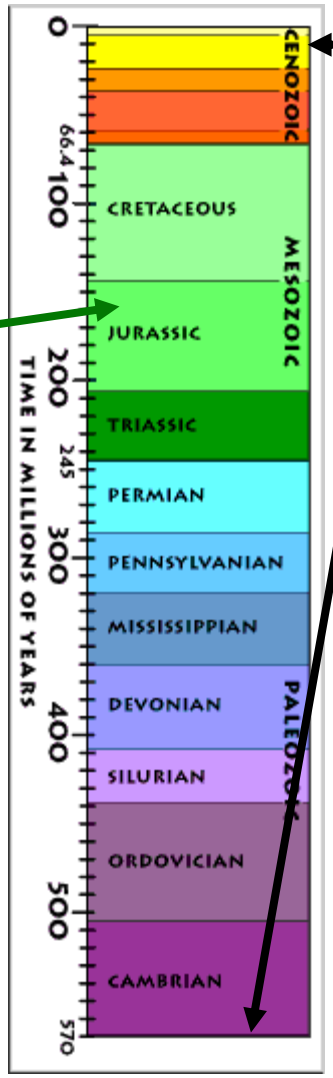
Dinosaurs arose in the Triassic. In this scene, *Plateosaurus* (larger) spies two *Yaleosaurus* (left) and a smaller *Coelophysus* behind. Cycads were a dominant vegetative type. The taller trees belong to the genus *Bjuvia*.

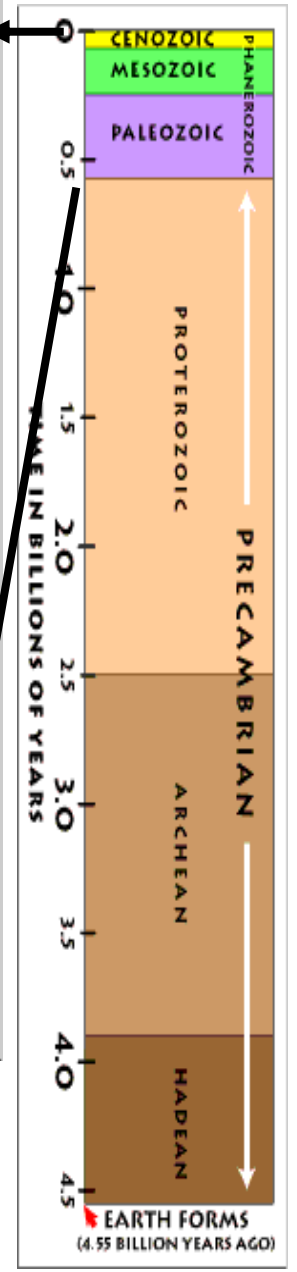
Phanerozoic Eon: Mesozoic Era (252.17 MYA – 66 MYA)

- Cretaceous Period (145 MYA - 66 MYA)
- **Jurassic Period (201.3 MYA – 145 MYA)**
- Triassic Period (252.17 MYA – 201.3 MYA)

http://www.ucmp.berkeley.edu/mesozoic/jurassic/jurassic.php

Clockwise from top left, *Ichthyosaurus intermedius*, a Lower Jurassic ichthyosaur from Glastonbury, England. *Karaurus sharovi*, one of the earliest known salamanders, from Kazakhstan. *Diplodocus*, a large, long-necked sauropod. Modern cycads.





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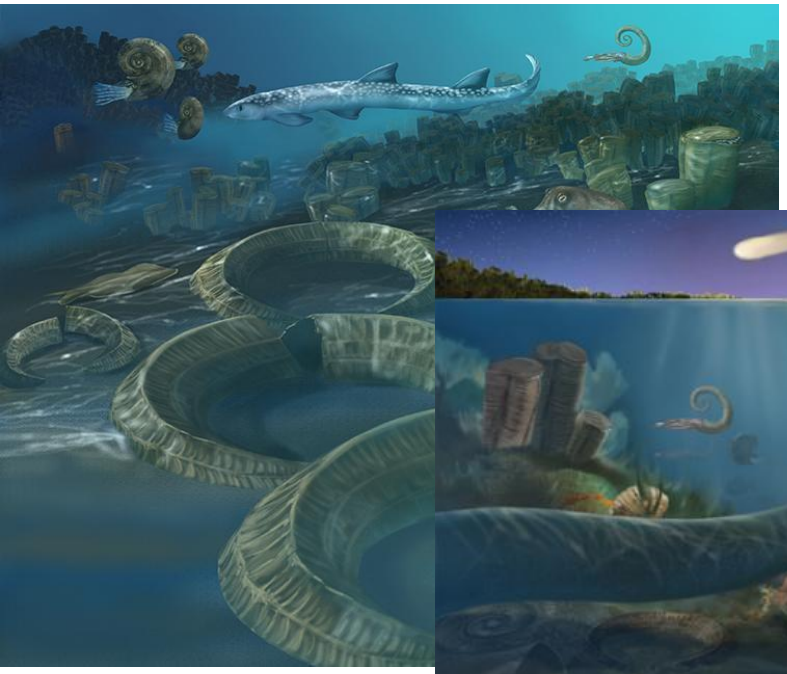
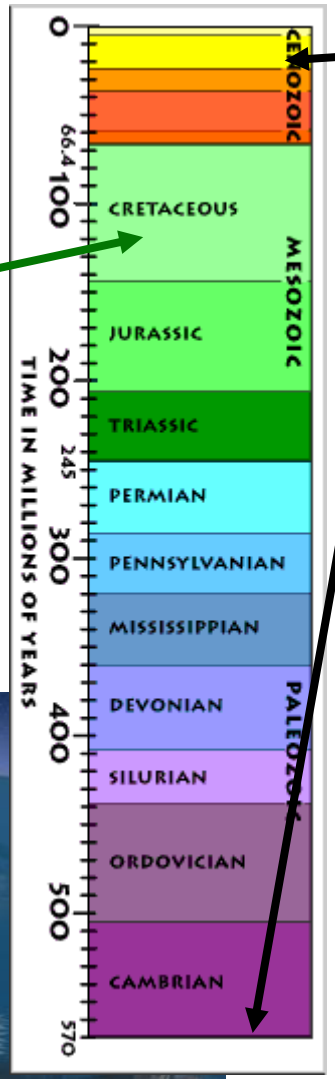
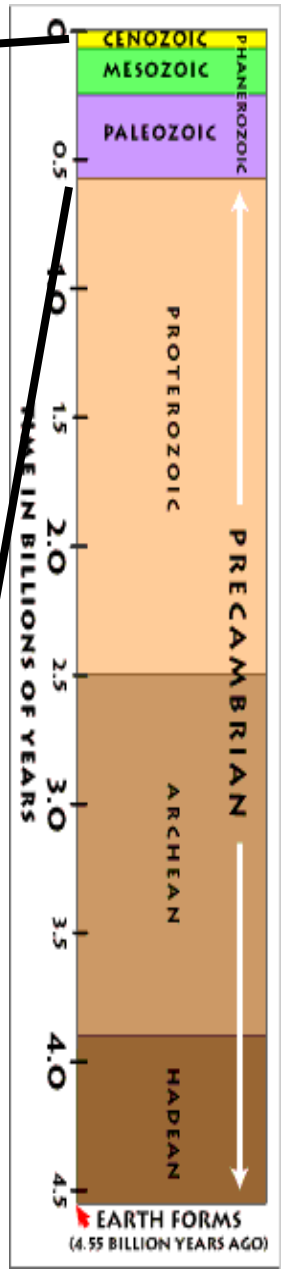
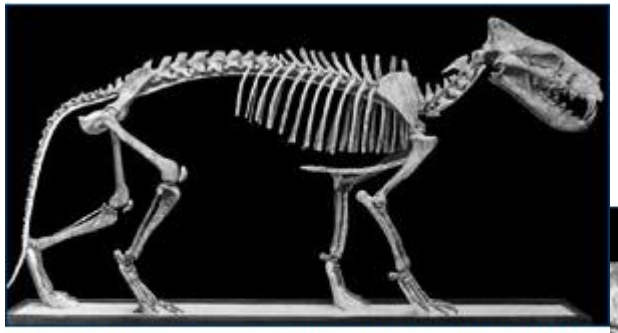






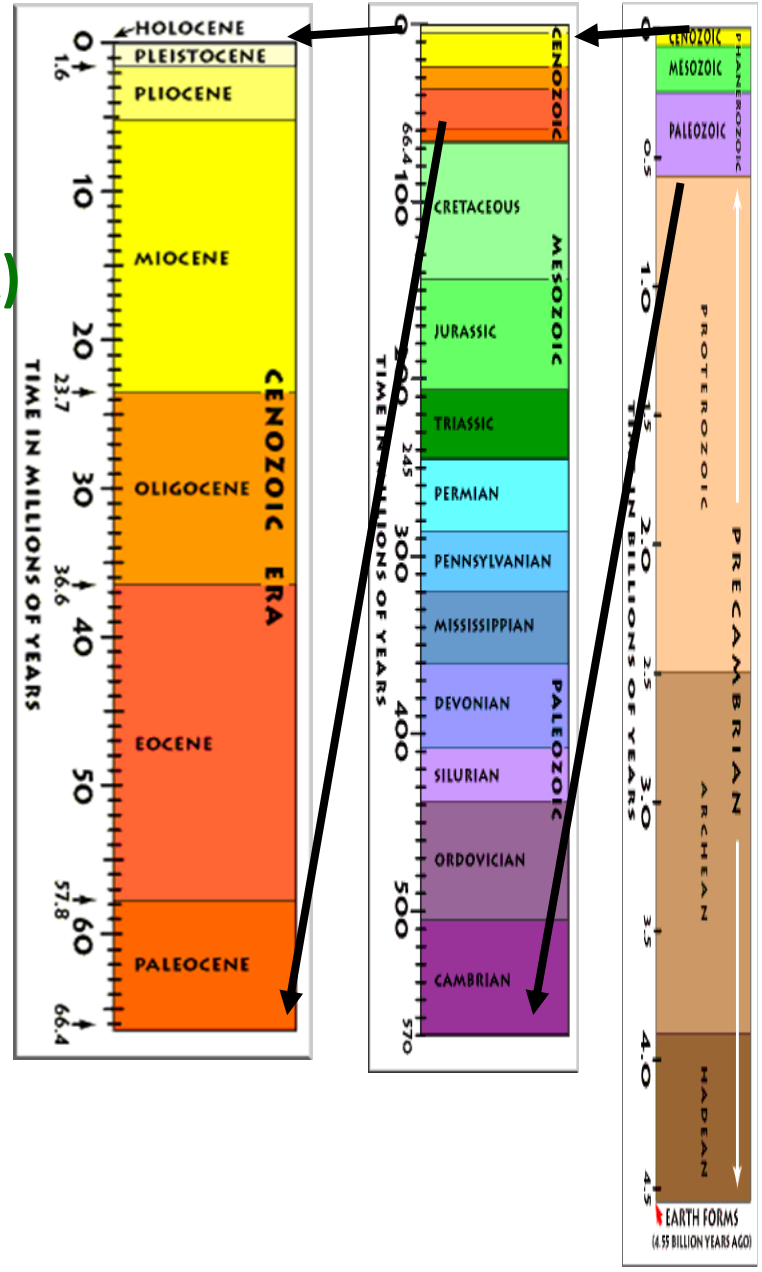
Phanerozoic Eon: Cenozoic Era (66 MYA – present)

- **Paleogene Period (66 MYA – 23.03 MYA)**
  - > Oligocene Epoch (33.9-23.03 MYA)
  - > Eocene Epoch (56 - 33.9 MYA)
  - > Paleocene Epoch (66 - 56 MYA)



Hyaenodon horridus, a large carnivorous mammal from the White River Oligocene of South Dakota. Deposits containing *Hyaenodon* are found in Badlands National Park.

Dentary of *Viverravus acutus*, a small, civet-like Eocene mammal, collected by Malcolm McKenna, Big Horn County, WY, 1950.

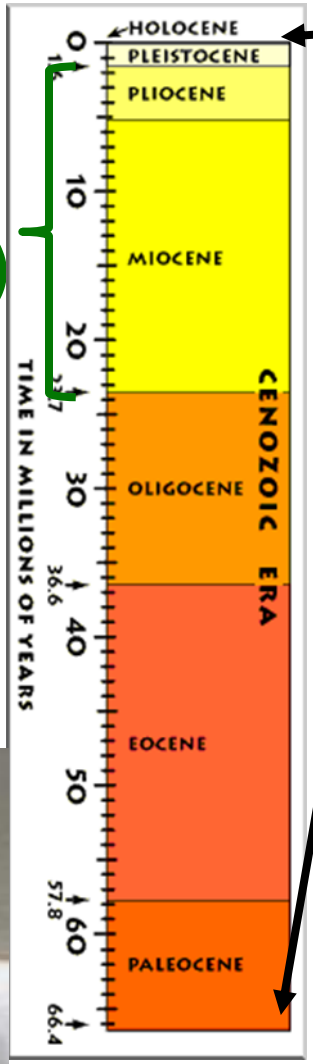


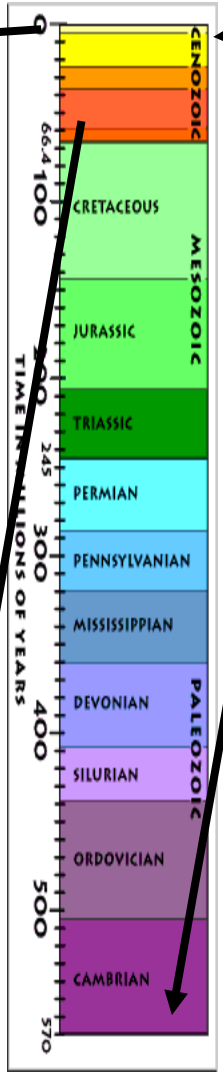
Phanerozoic Eon: Cenozoic Era

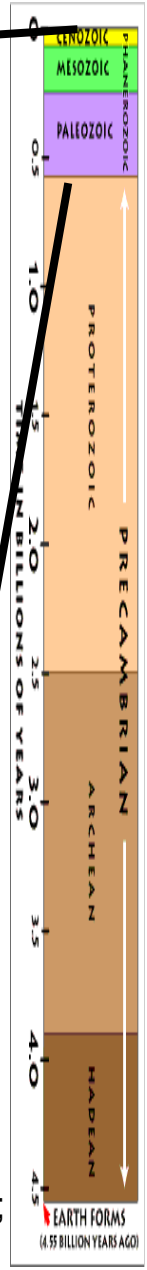
(66 MYA – present)

- **Neogene Period (23.03 MYA – 2.58 MYA)**
  - > Pliocene Epoch (5.333-2.58 MYA)
  - > Miocene Epoch (23.03-5.333 MYA)

Livyatan melvillei
extinct whale above



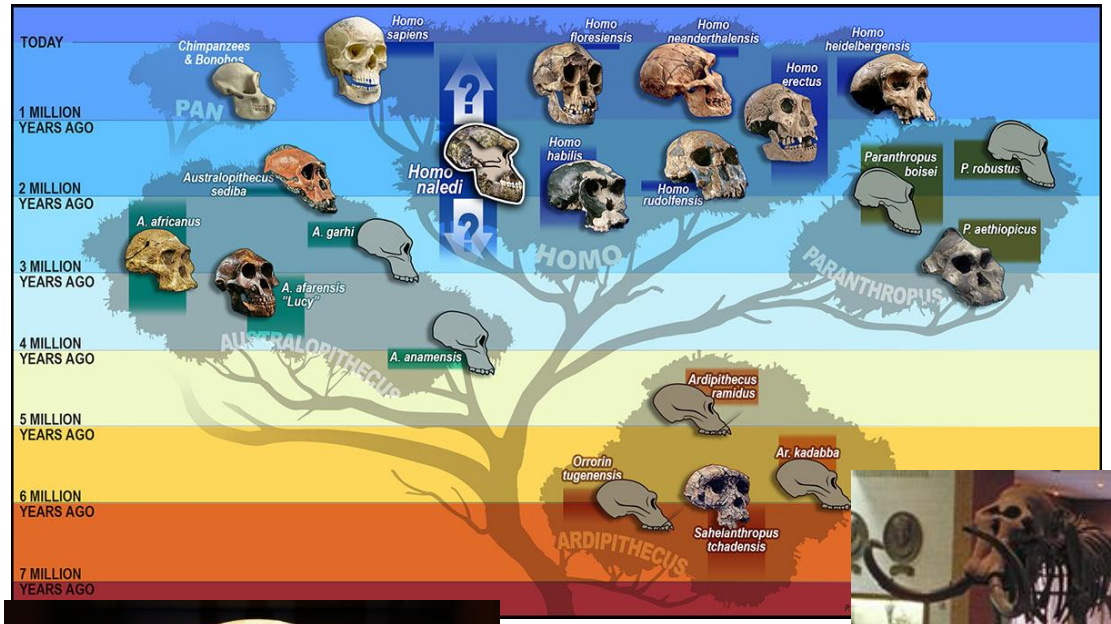




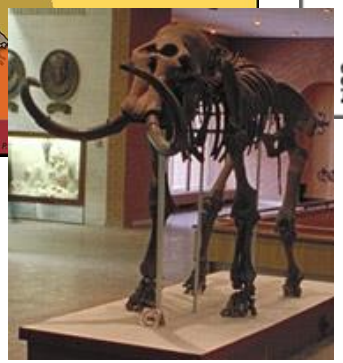
Extinct "walrus-face whale" top right;
Extinct *Ground Sloth* bottom right

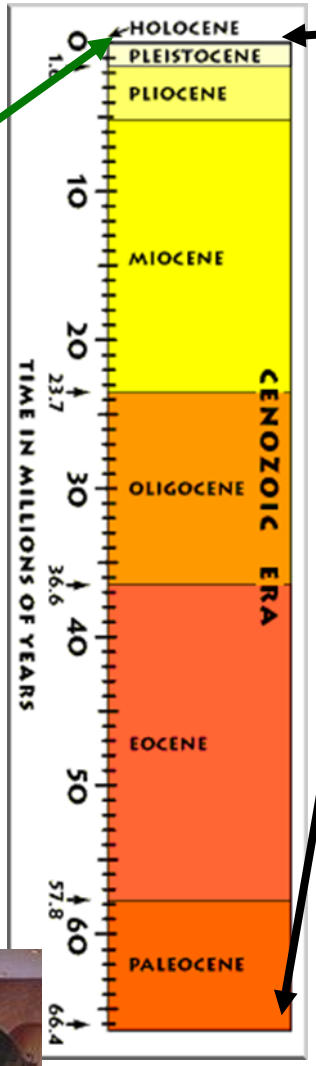
Phanerozoic Eon: Cenozoic Era
(66 MYA – present)

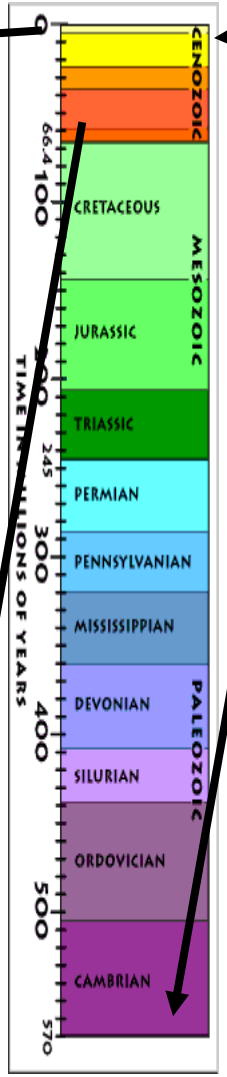
- **Quaternary Period (2.58 MYA – present)**
  - > Holocene Epoch (11,700 YA-present)
  - > Pleistocene Epoch (2.58 MYA-11,700 YA)

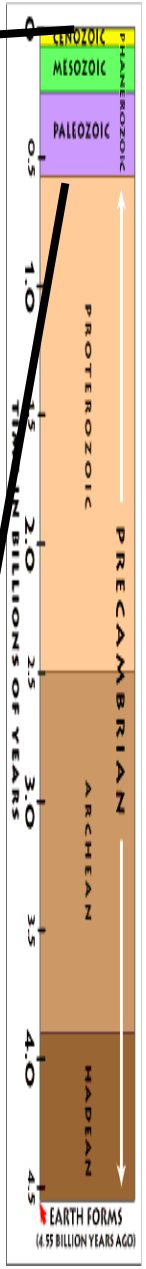


Glyptodon
(Left)
Mastodon
(Right)





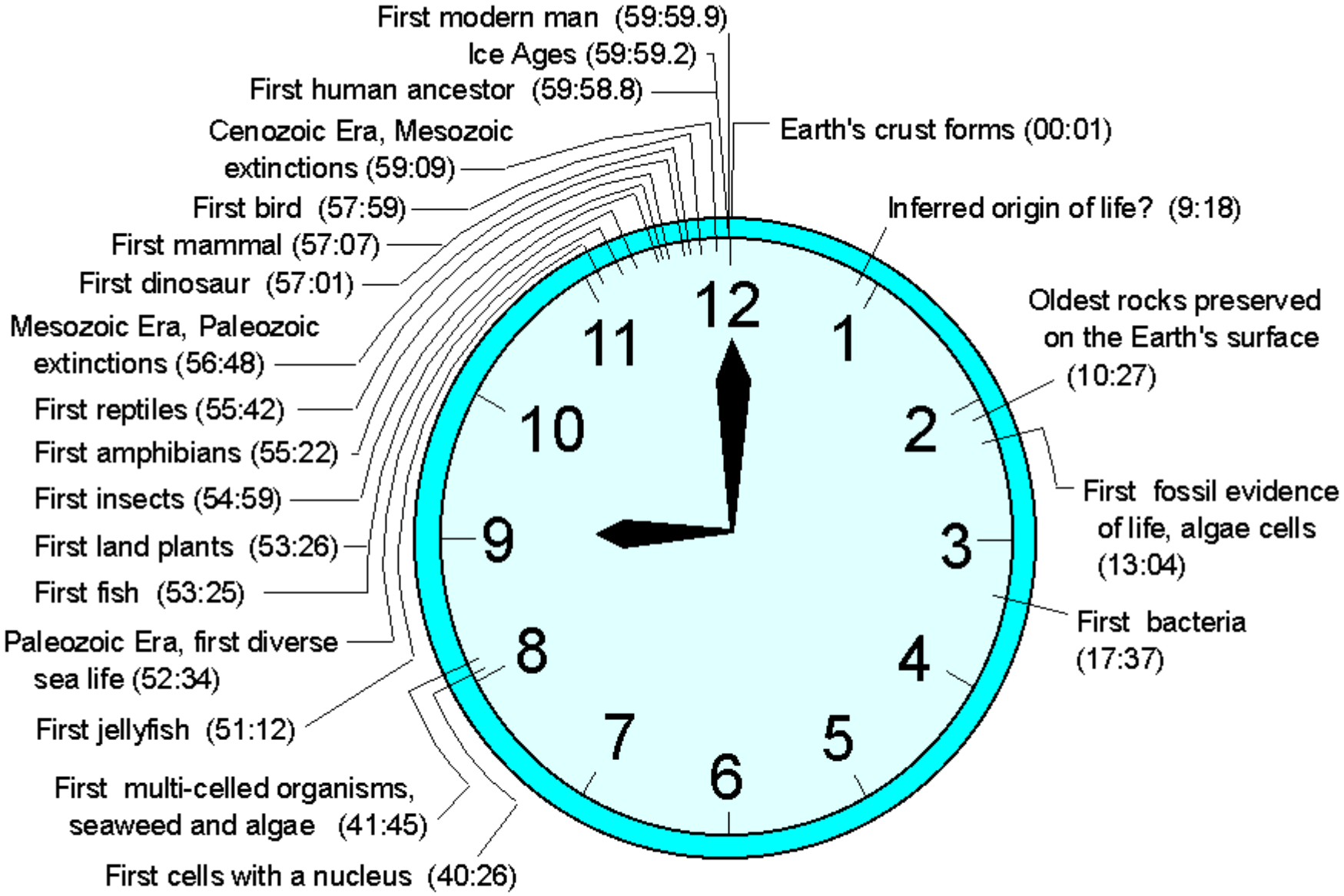




Geological Timeline

- Life is thought to have began in the sea after Earth had been lifeless for a majority of time.
- Life began simple and then became more complex over time.
- The dates change annually because scientists are constantly learning from new discoveries and new technology.


MESOZOIC ERA
PALEOZOIC ERA
CENOZOIC ERA
PRECAMBRIAN ERA
TRIASSIC PERIOD
JURASSIC PERIOD
CRETACEOUS PERIOD
TERTIARY PERIOD
CAMBRIAN PERIOD
ORDOVICIAN PERIOD
SILURIAN PERIOD
DEVONIAN PERIOD
MISSISSIPPIAN PERIOD
PENNSYLVANIAN PERIOD
PERMIAN PERIOD
Paleocene Epoch
Eocene Epoch
Oligocene Epoch
Miocene Epoch
Pliocene Epoch
Pleistocene Epoch
Holocene Epoch
TERTIARY PERIOD
QUATERNARY PERIOD
65 MILLION YEARS AGO
1 B.Y. AGO
2 B.Y. AGO
3 B.Y. AGO - EARLIEST ORGANIC STRUCTURES



4.6 billion years in one hour

https://www.uky.edu/KGS/education/clockstime.htm

Geological Timeline

- One thing to be sure is that you can't always believe the Hollywood movies of prehistoric time

If Jurassic Park Were In Different Geological Eras

https://www.youtube.com/watch?v=0VXIEA_U2QY

Resources

- 2015 ISC Chart used for dating http://www.stratigraphy.org/ICSchart/ChronostratChart2015-01.pdf
  - **For most updated check the ISC website: http://www.stratigraphy.org/index.php/ics-chart-timescale**
- NASA. Blue Marble. https://www.nasa.gov/sites/default/files/1-bluemarble_west.jpg
- NASA. Apollo 8: Christmas at the Moon http://www.nasa.gov/topics/history/features/apollo_8.html Dec. 19, 2014
- USGS. The Geologic Time Spiral. http://pubs.usgs.gov/gip/2008/58/
- Timeline. http://www.google.com/imgres?imgurl=http://minerals.dmitre.sa.gov.au/__data/assets/image/0017/41246/geo_scale.gif&imgrefurl=http://minerals.dmitre.sa.gov.au/education/geological_timescale&h=2421&w=402&tbnid=LWv7ZZTjcOgzBM:&docid=eVIWGWfshj2PmM&ei=xCKtVeHTEYutogSkwoqYCg&tbm=isch&ved=0CC0QMygRMBFqFQoTCOHF_r2R6sYCFYuWiAodJKECow
- Color Timeline: http://geomaps.wr.usgs.gov/parks/gtime/gtime2.html
- Stromatolite image: biology.fullerton.edu

South Carolina Aquarium