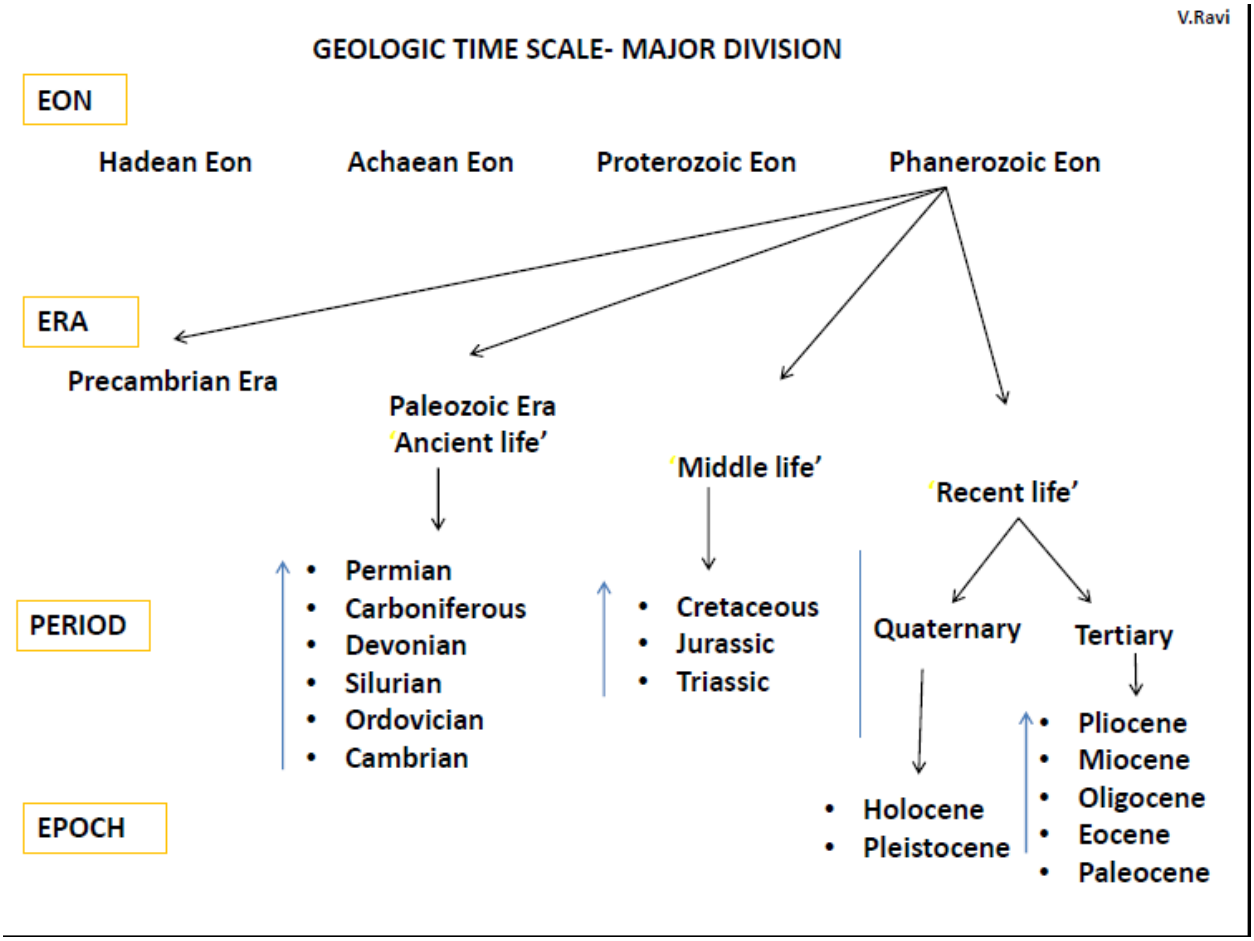
# GEOLOGICAL TIME SCALE

The geologic time scale relates with the order and relative position of strata with time to describe the timing and associations between events that occurred throughout Earth's history.

## MAJOR DIVISIONS OF GEOLOGIC TIME SCALE



**PHANEROZOIC EON**

- ‘Phanerozoic’ means ‘appearance of life’ in Greek.
- Term used by geologist George Halcott Chadwick (1930)
- Divided into 3 Eras: Paleozoic, Mesozoic & Coenozoic

**1. PRECAMBRIAN ERA**

- Beginning of geologic history when rocks were first formed
- 4.5 billion years ago to 545 million years ago (mya)
- Continents began to form; oceans and atmosphere started forming
- Life in the form of primitive bacteria may have originated

2. **PALEOZOIC ERA** ( 545 mya to 245 mya)

1) **Cambrian Period** (545 mya to 505 mya)
   - Named by Adam Sedgwick after fossils uncovered in Wales (1935), known to Romans as Cambria
   - Multiple collisions gave rise to a vast landmass- Gondwanaland
   - Abundance of marine invertebrates- sponges, bryozoans, brachiopods, mollusks, primitive arthropods like trilobites
   - Fossil preservation- hard shells and skeleton of chitin/ lime
2) **Ordovician Period** (505 mya to 439 mya)
   - Named after an ancient Welsh tribe
   - Climate was warm and humid
   - Invertebrates dominant, especially burrowing forms
   - Primitive fish with bony armour plates
   - Corals, crinoids, bryozoans and clams appeared
3) **Silurian Period** (439 mya to 409 mya)
   - Named after Sir Roderick Impey
   - Coral reefs growing in warm marine waters
   - Terrestrial vegetation- psilophytes
   - First terrestrial insect- an air breathing scorpion
4) **Devonian Period** (409 mya to 363 mya)
   - Named after Devonshire where sedimentary rocks of this period were uncovered
   - Air- breathing Arthropods- Spiders & Mites
   - Ammonoids- coiled mollusks appeared
   - First woody plants appeared followed by ferns
   - Age of Fishes- Sharks, Lungfish, Armoured fish, Primitive forms of Ganoid fishes
5) **Carboniferous Period** (363 mya to 290 mya)
   - ‘Carbo’ means ‘coal’ & ‘ferre’ means ‘ bear’ in Latin
   - 2 parts- Mississipian and Pensylvanian

- During Mississipian- land plants diversified; echinoderms and foraminiferans diversified; primitive lizard- like amphibians (Stegocephalia)
- During Pennsylvanian- first reptiles appeared; first true conifers

6) **Permian Period** (290 mya to 245 mya)
   - Named after a village in East Russia called Pern by Sir Roderick Impey Murchinson (1841)
   - Rich in deposit of coal, oil & gas
   - Invertebrate life exceptionally rich though most experienced mass extinction towards the end of the period
   - Reptiles were undergoing evolutionary development
   - Thecodontia- ancestors of mammals evolved
   - Amphibians reduced in number

**3. MESOZOIC ERA** (245 mya to 65 mya)

- Considered as the ' Age of Reptiles'
- First birds and mammals also appeared
- 3 Time Periods- Triassic, Jurassic and Cretaceous

a) **Triassic Period** (245 mya to 208 mya)
   - Named after three- fold nature of rocks
   - Mesozoic reptiles (dinosaurs) first evolved at this time
   - Aquatic reptiles (Icthyosaurs) and flying reptiles (Pterosaurs appeared)
   - Appearance of first mammals- small & reptilian in size
   - Teleostei- first ancestors of modern bony fishes
   - Ginkos, conifers and palms observed

**b) Jurassic Period** (208 mya to 146 mya)
   - Named after Jura mountains, France
   - Extensive adaptive radiation among reptiles
   - Four footed sauropods, (Brontosaurs), two footed carnivores (Allosaurs), winged reptiles, marine reptiles (ichthyosaurs and plesiosaurs), primitive crocodiles were seen
   - Mammals comprised 4 Orders
   - Shellfish included lobsters, shrimps and ammonites

c) **Cretaceous Period** (146 mya to 65 mya)
   - Named after the chalk strata
   - Largest of pterodactyls, the Archaeopteryx lived
   - Appearance of horned dinosaurs, snakes and lizards
   - First marsupials and fist placental mammals appeared

- Development of deciduous plants like fig, poplar etc. (angiosperms)

4. **CENOZOIC ERA** (65 mya to present day)
   - 2 Periods- Tertiary & Quartenary
   - Popularly called ‘ Age of Mammals’

**1) Tertiary Period**

**i. Paleocene Epoch (65 mya to 55 mya)**
- Paleocene mammals appeared in northern Asia and migrated to other parts
- Seven groups of mammals out of which the predominant ones are Creodonts, Amblyopods and Condylarths

ii. **Eocene Epoch** (55 mya to 34 mya)
- Direct evolutionary ancestors of modern mammals like horse, camel, rodent and monkey appeared
- First aquatic mammals (ancestors of modern whales)
- Modern birds like eagle, pelicans appeared

iii. **Oligocene Epoch** (34 mya to 23.5 mya)
- First anthropoid apes appeared
- Archaic mammals gave way to modern mammal groups
- Credonts became extinct and the first true carnivores (resembling dog and cat) appeared

iv. **Miocene Epoch** (23.5 mya to 5.2 mya)
- First appearance of grasses and development of grazing animals like horses, camels, rhinoceroses
- Gorilla- like ape- Dryopethicus

v. **Pliocene Epoch** (5.2 mya to 1.64 mya)

Known as the climax of the ‘ Age of Mammals’

Paleontology differs very slightly from the previous epoch

**2) Quaternary Period**

i. **Pleistocene Epoch** (1.64 mya to 10, 000 years ago)
- Abundance of large mammals like buffalo, elephant, mammoths etc.
- Mammoths, sabre- toothed tigers became extinct by the end of this period
- Appearance of first bears

ii. **Recent Epoch** (10, 000 years ago- present day)
- Also called ‘Holocene Epoch’; ‘Holocene’ means ‘wholly recent’ Marked by the melting of huge ice-sheets.Human evolution continued and taken over by cultural evolution.

**References**:

Colbert, Edwin H. Evolution of the vertebrates, Second edition New York. John Wiley & Sons, Inc., 1969, 535 pp.

Ogg,James G., Gabi Ogg, Felix M. Gradstein. The Concise Geologic Time Scale, Cambridge University Press, New York, 2008, 184pp.