# HISTORY OF LIFE ON EARTH

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# History of life on earth

Age of earth- 4,500-5,000 my

2,500 -3,000my – no life on earth- only molecular evolution – Azoic era

Total life span of earth "Geological Time"

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# Geological Time - really, really, really long!

Motion pictures are generally projected at 32 frames per second. Therefore, each frame (image) is on the screen for only split second- let each frame represent 100 years. Start movie at present and go back in time.

- The Declaration of Independence would show up 1/16 of a second into the movie.
- The Christian era (BC-AD boundary) would be 3/4 of a second into the movie.
- The most recent Ice Age would be 7 seconds into it.
- The movie would run about 6 hours before we got to the end of the Mesozoic era (extinction of the dinosaurs).
- We'd have to watch the movie for about 2 days to see the beginning of the Paleozoic era (macroscopic life).
- The whole movie (to the beginning of geologic time on Earth) would be approximately 16 days long!

# Geological time scale

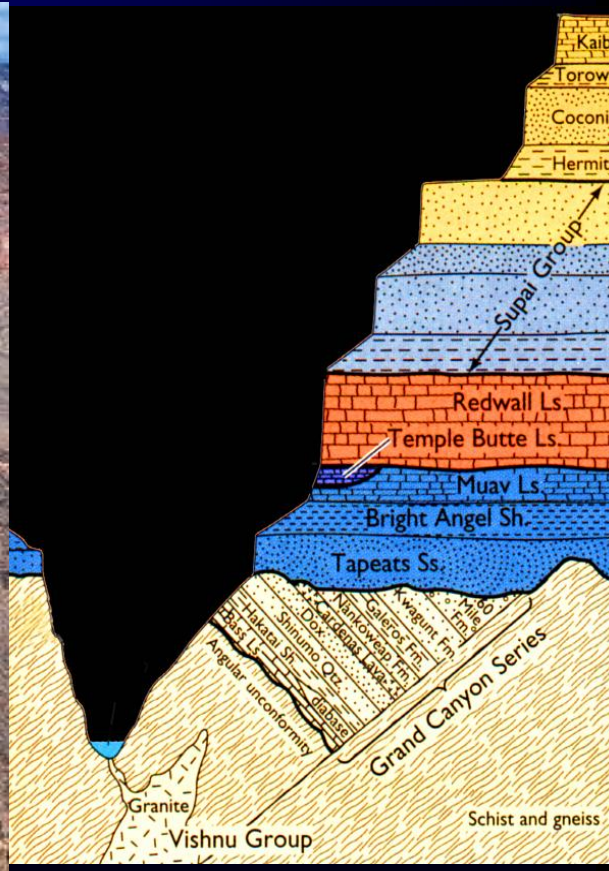
- **The geologic time scale divides Earth's history based on major past events.**
- **Geologist use 2 crtiteria for sub dividing the geological history – time & earth's stratification**

# Geologic time scale divisions

- The geologic history of the Earth is broken up into hierarchical chunks of time. From **largest to smallest**, this hierarchy includes **EONS, ERAS, PERIODS & EPOCHS**.
- Based on strata geological history of earth is divided into systems, series, stages and zones
- Chadwick (1930) – 2 eons- Cryptozoic / Archaeozoic eon & Phanerozoic eon
- 4 eons- Hadean / Priscoan (4000mya), Archaean(4000-2500mya), Proterozoic(2500-600 mya) & Phanerozoic(from 600mya to recent)
- Phanerozoic eon consist of 3 eras – **Palaeozoic, Mesozoic and Coenozoic**
- Hadean, Archaean, Proterozoic eon consist of single era- **Archaeozoic / Pre-Cambrian era**

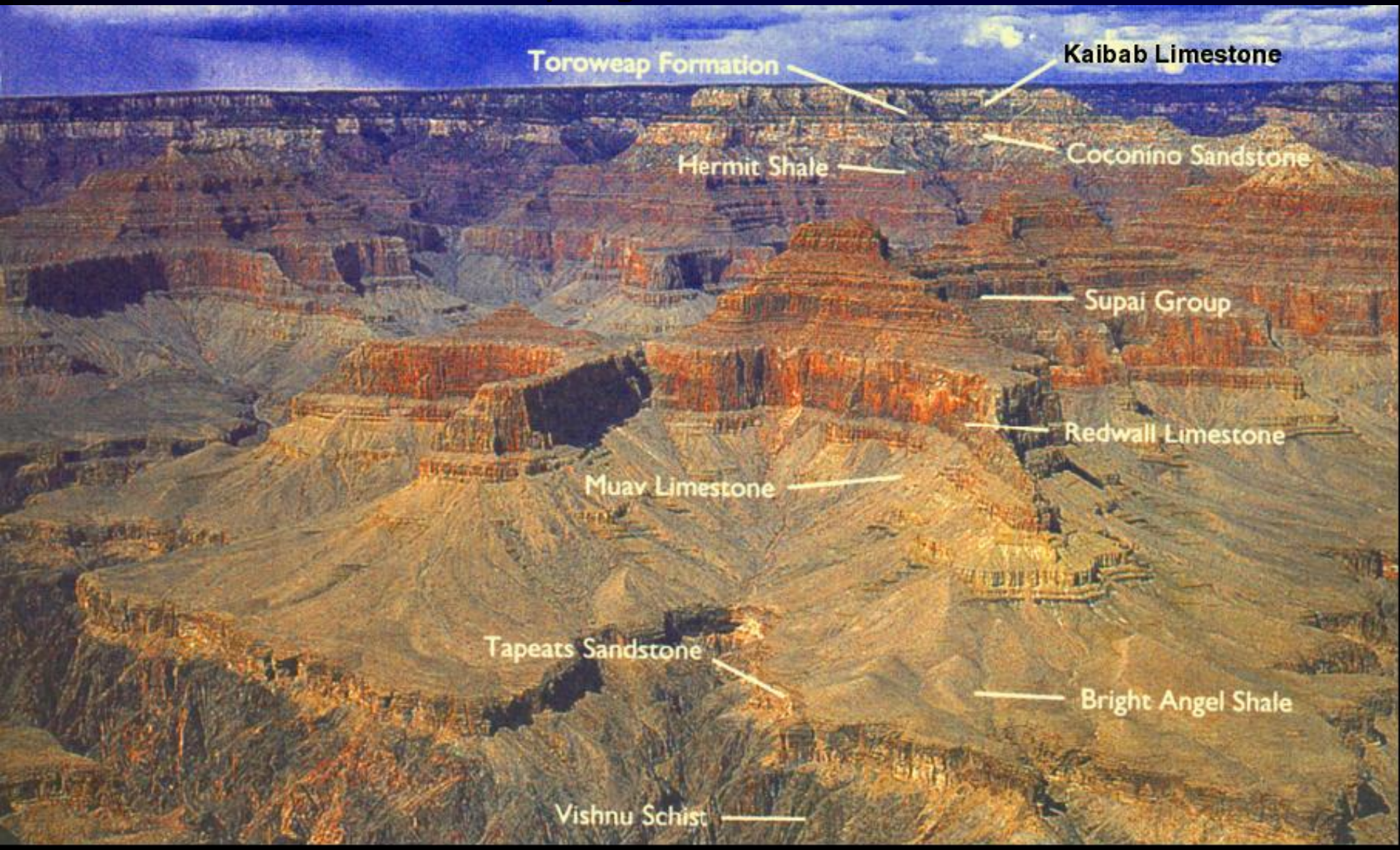
# History of Historical Geology

- *Niels Stensen (Nicolaus Steno)*
  - ***Fundamental Principles of Relative Time***
    - > ***Principle of Superposition-  see below***
    - > ***Principle of Original Horizontality-  see below***
    - > ***Principle of Original  Lateral Continuity-  see below***

# Law of Superposition

- In undisturbed strata, the layer on the bottom is oldest, those above are younger.



# Archaeozoic era

- Time before 4000mya
- Single period- Pre-cambrian
- Orin of earth & emergence of life
- Great volcanic activity, formation of mountains
- Cyanobacteria, bacteria, primitive eukaryotes, primitive multicellular organisms
- **Rocks with very few fossils?**

# Archaeozoic era

- Duration : about 2,000my
- Geologic condition: great volcanic activity, extensive erosion, upheavals of land masses, formation of mountains
- Climate : excessive heat & pressure
- Fauna : no recognizable fossils, unicellular organisms

# Palaeozoic era(ancient life)

- Duration : 375 my
- Mild climate, formation on inland seas
- Age of invertebrates
- Fauna : extensive fossils of higher invertebrates, fishes, amphibians
- Origin of fishes, amphibians, reptiles, aquatic & land plants
- 6 periods- cambrian, ordovician, silurian, devonian, carboniferous(mississipian&pennsylvanian), permean

# Cambrian period

- Duration : 80-100 my
- Geologic condition: low lands, oceans, flooded inlands
- Climate : mild
- Fauna : dominance of trilobites & brachiopods, all invertebrate phyla

# Ordovician period

- Duration : 60
- Geologic condition: great submergence of land
- Climate : warm
- Fauna : first corals, cephalopods, first fishes, snails, trilobites abundant

# Silurain period

- Duration : 40
- Geologic condition: extensive continental seas
- Climate : low lands increasingly arid
- Fauna : air breathing vertebrates developed, primitive jawless vertebrates, ancestors of fresh water fishes & cartilaginous fishes

# Devonian period

- Duration : 50my
- Geologic condition: smaller island seas, lands higher, great volcanic activity, formation of coal, oil and gas
- Climate : more arid, periodic spells of drought and heavy rains resulting in complete drying up or flooding
- Fauna : age of fishes, lung fishes & sharks abundant, appearance of first land vertebrates

# Carboniferous period

- Duration : 80my
- Geologic condition: great coal swamps
- Climate : mild & moist
- Fauna : dominated by shark, sea lilies, insects and amphibians, winged insects attained maximum size, first reptiles

# Permian period

- Duration : 45 my
- Geologic condition: seas retreated and continents uplifted all over the world, shallow seas became dry lands
- Climate : cool and dry due to increased glaciation and aridity
- Fauna : many ancient animals died out, due to great climatic and geological changes; radiation of reptiles, modern insects arose

# Mesozoic era (medival life)

- Lasted over 155my
- Golden age of reptiles
- Triassic (age of cycads), Jurassic and cretaceous period – suitable for plant growth
- Flowering plant emerged
- Extensive mountain building, inland seas and swamps, initially warm but later cool
- Extinction of dianusaur and origin of placental mammal

# Triassic period

- Duration : 45my
- Geologic condition: continents exposed , wide spread desertification
- Climate : harsh & dry
- Fauna : origin of dinosaurs, pterosaurs, egg laying mammals, primitive amphibians became extinct

# Jurassic period

- Duration : 45 my
- Geologic condition: continents fairly high, shallow; seas swept over some of the continental area.
- Climate : warm and humid with plenty of rain fall
- Fauna : reptiles became dominant on the land, in the seas and air; larger and specialized dinosaurs originated, insectivorous marsupials

# Cretaceous period

- Duration : 65 my
- Geologic condition: chalk, shale deposited, mountain , inland seas, swamps
- Climate : warm & uniform, cooler later
- Fauna : dinosaurs reached peak, became extinct, first modern birds, archaic mammals

# Coenozoic era

- 2 periods- tertiary (5 epochs - palaeocene, eocene, oligocene, miocene & pliocene ), quaternary {2 epochs – pleistocene (glacial) & holocene (recent) }
- Age of angiosperms & age of mammals
- Ice to poles, formation of high mountain ranges

# Tertiary period

- Palaeocene –10my, inland seas , formation of climatic belts, spread of egg-laying mammals
- Eocene – 20my, mountains eroded, warm climate, placental mammals diversified, hoofed mammals& carnivores established
- Oligocene –15my, warmer- low lands, wide spread forest, archaic mammals became extinct, anthropoid apes, pigs
- Miocene- 15my, cooler – mountain formation, volcanic activities, adaptive radiation of mammals, first man-like apes
- Pliocene –7my, cool & temperate, mountain formation, volcanic activities, close relatives of modern elephants, horses, camels, man evolving

# Quaternary period

- Age  of mankind
- Lasted 3my
- Pleistocene – 3my, cold weather, repeated glaciation(4 ice ages), extinction of huge mammals, origin of modern man
- Holocene – 0.01my, relatively warmer, ice reduced, desert spread over vast area, man dominated, social & cultural evolution

# Cambrian explosion

- Evolutionary explosion – following  a mass extinction
- Cambrian period (490 to 540 mya) explosive evolution and extensive diversification of life- many of extinct and extant animal phyla
- Earth was warmer and wetter, all marine, all had hard parts- shells, exoskeletons, claws, but without vertebral column
- All invertebrates – so also called “Age of invertebrates”