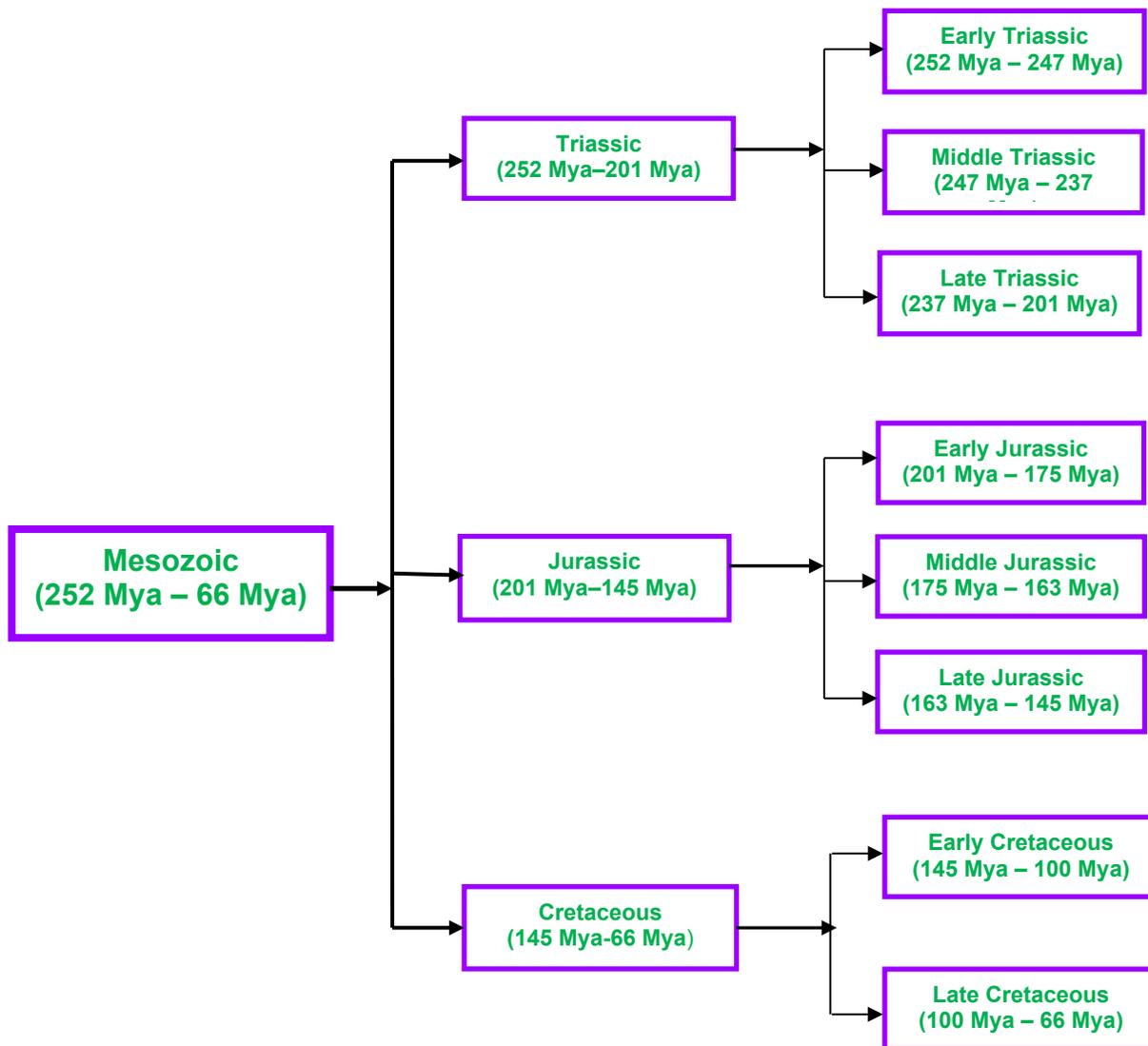


The Mesozoic: The Most Important Post Cambrian Era

Introduction

The second Era of the Phanerozoic Eon is Mesozoic covering a period of about 186 million years. It has three major periods and eight epochs. The diagram given below captures the divisions and subdivisions.



Mesozoic Era is remembered by all for two important events. The continents and subcontinents that we see today on our Mother Earth started forming with break up of the supercontinent *Pangaea* during this Era. Second, it is on this Pangaea, the awesome nightmarish *Dinosaurs* appeared and virtually reigned thundering across the Earth. Again, in this Era, sixty five million years ago, dinosaurs became extinct permitting the mammals, our ancestors to flourish and diversify. The climate was extreme – temperature varying from 80 degree to near zero degree

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celsius. Torrential seasonal rains drenched and flooded the land. Many volcanoes blew their tops together, belching sulphuric acid into the stratosphere and playing an important role in cooling the Earth. There were considerable changes in terrestrial vegetation – modern gymnosperms (speed-producing vascular plants) and angiosperms (flowering plants) appeared and diversified during this Era. One can say that the events that took place in this Era played important roles in making shape of the Earth and the human intelligence as we find today.

Pangaea: The Super Continent

Pangaea was formed about 270 million years ago during the Permian period, the last period of Paleozoic Era. It was massive and the only one supercontinent on the Earth. One could walk anywhere without any barrier and resistance. It started breaking during this Era because of the sudden rise of a superplume of molten lava through the Earth's mantle from its deep seething core. The first split created two continents – northern called **Laurasia** (consisting of present North America, Europe and Asia) and the southern called **Gondwana** (Present day's Africa, South America, Antarctica, Australia and India). Inner heat caused further tectonic rifts. First one occurred around 158 million years ago in Jurassic period separating India and Madagascar from Africa. Thereafter, around 130 million years ago, in the same Jurassic period, India and Madagascar separated from Antarctica. During Cretaceous period, around 90 million years ago, India separated from Madagascar and started moving towards north with slow but steady pace. In the beginning of the next Era, **Cenozoic**, about 55 million years ago, Indian craton collided with Eurasian plate, a part of Laurasia continent and created a tall mountain which we now know as the Great Himalayas. This Himalaya was once under the ocean – a fact that an ordinary person may not perceive now.

The Dinosaurs: The Most Fearsome Killing Machines and the Voracious Predators

The evolution of dinosaurs is the most startling event after Cambrian Explosion. During this Era, climate change was extreme with frequent heat spells followed by more moist and humid condition accompanied with heavy rainfall. This shift in climate accompanied by plate tectonics and massive volcanic eruptions caused change in oceanic circulation and global warming which ultimately created disequilibrium in carbon cycle. There was incessant heavy rainfalls providing favourable conditions for forests and vertebrates including reptiles to thrive on land. In this climate, known as **Carnian Pluvial Event**, a polymerase chain reaction might have taken place by which a DNA molecule started replicating itself making a trillion copies of the original

molecule creating the giant reptiles known as *dinosaurs' group*. This group filled virtually every ecological niche. There were swimming reptiles, flying reptiles and reptiles – some as tall as a six – storey building – thundering across the face of the Earth. Some of them had large brains, an upright posture and two little front legs very much like hands. Some of them were carnivorous, such as *Tyrannosaurus*, while some were herbivores such as *Diplodocus* and *Brachiosaurus*. Volume of brain of this group of reptiles was much less compared with their body weight. They were thus not very intelligent. Nearly all were cold – blooded and were forced into nocturnal immobility. They used to hunt the sleeping mammals during day time. Some well known examples of this group were: *Brachiosaurus* – weight (wt) 87 metric tons (mt) with brain volume (bv) of 150 cubic centimeters (cc); *Diplodocus* – wt 12 mt with bv of 50 cc; *Tyrannosaurus* – wt 8 mt with bv of 200 cc. Others were *Triceratops* (bv 70 cc) and *Stegosaurus* (bv 30 cc). The most intelligent of dinosaurs were *Saurornithoides* whose brain mass was about 50 gms with a body mass of about 50 kilograms.

These predator reptiles ruled the Earth in the Jurassic period and were the ubiquitous masters of life. However, in the Triassic period, there were many herbivorous reptiles. *Rhynchosaurs*, largest herbivorous reptiles with stocky bodies and powerful beak, appeared in the Early Triassic period. Late Triassic reptiles include *Phytosaurs*, having long toothed snout closely related to crocodiles and *Aetosaurs*, heavily armored herbivores having small heads and a body covered by plate like scutes (bony external plate or scale overlaid with horn). Big headed dinosaur like reptiles (*Rauisuchians*) and *Theropod* dinosaurs, descendants of birds were the top predators of the Triassic times. *Sphenosuchia Coelophysis (about 9 feet tall)*, another group of archosaurs evolved into true dinosaurs approximately 203 Mya in the Late Triassic period. They were very small, lightly built, bipedal fast moving carnivorous dinosaur having hollow limb bones, well developed large eyes, jaws equipped with sharp teeth, short arms with three fingered clawed hands, long flexible neck and a long tail. Archosaurs later got evolved into first pterosaurs (flying reptiles). As a matter of fact, the first dinosaurs appeared in the late Triassic. Early dinosaurs include *Eoraptor*, *Herrerasaurus*, *Staurikosaurus*, and *Coelophysis*. These creatures were small, bipedal and carnivorous.

Extinction of Dinosaurs

There are literally dozens of scientific hypotheses that attempt to explain this event. They range from massive climatic change to mammalian predation to the extinction of a plant with apparent

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laxative properties, in which case the dinosaurs died of constipation. One of the most interesting and promising hypotheses is that the dinosaurs died because of a nearby supernova event – the explosion of a dying star some tens of light-years away, which resulted in an immense flux of high energy charged particles that entered our atmosphere, changed its properties, and, perhaps by destroying the atmospheric ozone, let in lethal quantities of solar ultraviolet radiation. Nocturnal animals, such as the mammals of the time, and deep-sea animals, such as fish, could have survived this higher ultraviolet intensity; but daytime animals that lived on land or near the surface of the waters were destroyed. Some paleontologists believe that the demise of the dinosaurs was accelerated by nocturnal predation on reptilian eggs by the early mammals. Some scholars feel that, around 90 million years ago, when Indian craton drifted north wide after being separated from Madagascar, passed over the Reunion ‘hotspot’, which caused an outburst of volcanic activity. This massive volcanic eruptions might have been one of the reasons for extinction of dinosaurs. Whatever may be the causes of disaster, most of the reptiles and other species on the Earth were destroyed. Most of species of mammals including shrews who used to live on the trees, however, survived.

Mammals

Early mammals of the late Triassic were very small, arboreal or nocturnal, mainly herbivores or insectivores, and therefore, were not in direct competition with the Archosaurs or dinosaurs. *Eozostrodon* (small shrew like creatures) was the among the earliest known tree-dwelling mammal having a weasel-shaped body, three ear bones like modern mammals and a jaw with both mammalian and reptilian characteristics. *Adelobasileus* (a shrew-like animal) was a transitional form between cynodonts and other Triassic mammals from the late Triassic period. Another small shrew like mammal, *Juramaia* was the earliest known eutherian mammal (ancestor of placental mammals) of the late Triassic period. After extinction of the dinosaurs, *mammals* moved into day time ecological niches. They were no longer required to live with fear of dinosaurs. They diversified and flourished.

Climate

The Mesozoic Era is known for a climate characterized by rain-forest-like conditions. Peat bogs that later formed into massive coal deposits existed throughout many parts of the Earth. Most of the land was suitable for plant and animal growth and diversity. Sea levels rose and created warm, shallow-coast environments conducive to coral reef development. The increased humidity

levels due to flooded landmasses, lush green vegetation, and lack of polar ice increased carbon dioxide levels creating a “*greenhouse*” climate. Even, the polar regions had a temperate climate. Analyses of fossil, sediment distribution and geochemical analyses suggest existence of an expanded tropical zone with less temperature difference between the equator and the poles in this Era. Large salt deposits during this Era suggest existence of areas of high aridity. Extensive coal deposits suggest areas of high precipitation. Fossil analyses further indicates existence of arid belt on the western side of Pangaea and humid conditions on the east. Both surface waters and deep waters in the low latitudes were warm (20°C and 17°C respectively). A drop in temperature occurred at the Jurassic–Cretaceous boundary. Ocean circulation was sluggish because of the warm temperatures, lack of ocean density gradients, and decreased winds.

Conclusion

Our Mother Earth, during its entire transformation period, probably created environment and changed the climate in such a manner that had helped development of human beings as we are today. The Mesozoic Era is the best witness for such an enormous and strong desire of our Mother Earth. Science, of course, has explanations for whatever have happened. Just imagine the giant dinosaurs who, about 65 million years ago, was dominantly ruling the Earth, killing mammals for their heavy quantity of foods, were destroyed in one catastrophic event. Nearly 96 percent of all the species in the oceans and almost all species of reptiles died in the late Mesozoic times. But a small and unrepresentative samples of mammals and shrews survived. They were our ancestors and for whom we exist today. Had the dinosaurs not been extinguished, would the dominant life forms on Earth today been possible? If we go a little backward of the sequence of events that took place in this Era, the very existence of human beings, can be traced to the death of a distant Sun. May be the supernova explosion would have extinguished all lives on the other planets also but had spared our Mother Earth for unknown reasons. Whatever may be the cause, we see again how our existence is linked with random astronomical and geological events created by our Mother Earth. So, should we not respect our Mother Earth and save it from extinction?