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NAAC ACCREDITED “A” GRADE

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Mass Extinction

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Mass Extinction:

Mass extinction refers to the rapid extinction of a large number of lineages scattered throughout the tree of life. More specifically, a mass extinction occurs when at least 60 percent of the species present are wiped out within 1 million years.

These are catastrophic episodes that wipe out huge numbers of species and lineages in a short time, giving the tree of life a drastic pruning. They are the polar opposite of adaptive radiation.

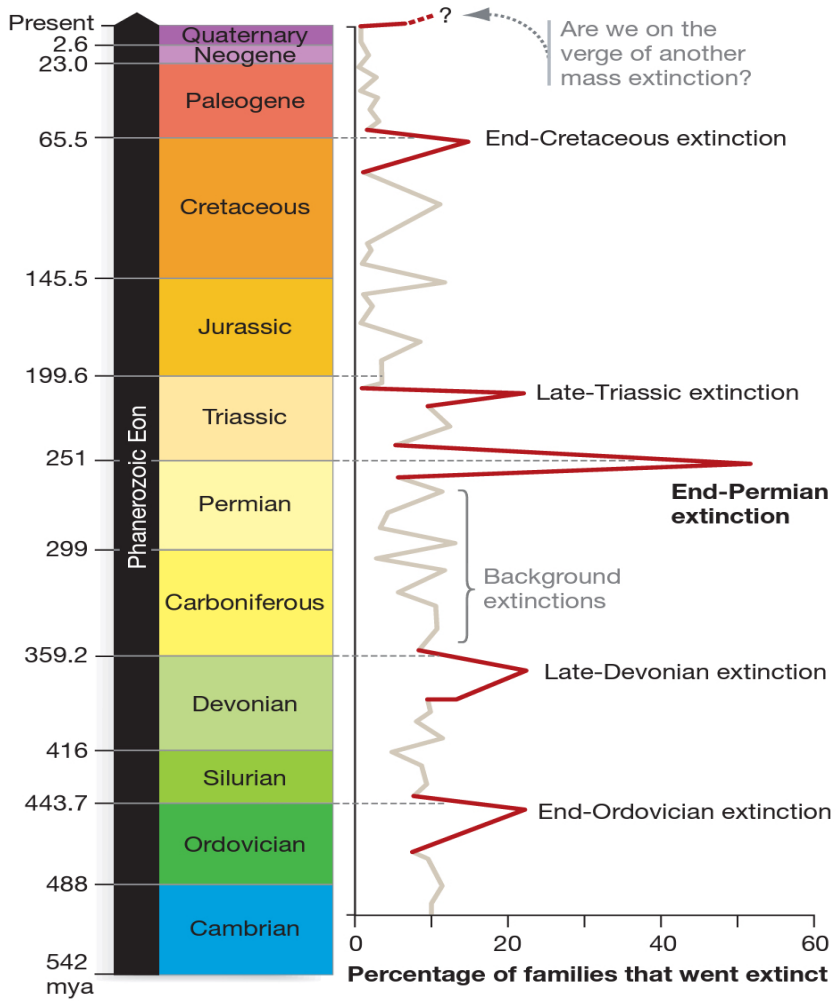
Mass extinctions result from extraordinary, sudden, and temporary changes in the environment. During a mass extinction, species do not die out because individuals are poorly adapted to normal or gradually changing environmental conditions. Rather, species die out from exposure to exceptionally harsh, short-term conditions—such as huge volcanic eruptions or catastrophic sea-level changes.

Background Extinction:

Background extinction refers to the lower, average rate of extinction observed when a mass extinction is not occurring. Although there is no hard-and-fast rule for distinguishing between background and mass Extinction.

Basically normal rate of species extinctions are called Background extinction.

Background extinctions are thought to occur when normal environmental change, emerging disease, predation pressure, or competition with other species reduces certain populations to zero.



The Big Five Mass Extinction Events :

This graph shows the percentage of lineages called families that went extinct over each interval in the fossil record since the Cambrian explosion.

Over 50 percent of families and 90 percent of species went extinct during the end-Permian extinction.

End Ordovician mass Extinction:

End Ordovician, 444 million years ago, 86% of species lost
Graptolite 2-3 cm length
Graptolites, like most Ordovician life, were sea creatures.
They were filter-feeding animals and colony builders. Their demise over about a million years was probably caused by a short, severe ice age that lowered sea levels, possibly triggered by the uplift of the Appalachians. The newly exposed silicate rock sucked CO_2 out of the atmosphere, chilling the planet.

End Devonian mass Extinction:

- Late Devonian, 375 million years ago, 75% of species lost
- Trilobite, 5 cm length
- Trilobites were the most diverse and abundant of the animals that appeared in the Cambrian explosion 550 million years ago.
- Their great success was helped by their spiky armour and multifaceted eyes. They survived the first great extinction but were nearly wiped out in the second.
- The likely culprit was the newly evolved land plants that emerged, covering the planet during the Devonian period. Their deep roots stirred up the earth, releasing nutrients into the ocean.
- This might have triggered algal blooms which sucked oxygen out of the water, suffocating bottom dwellers like the trilobites.

- At the end of Devonian, a massive mass extinction wiped out 75% of all living forms in the ocean. This was triggered possibly by two meteorite collisions. In addition, rapid movement of the continental shelves may also have resulted in geological activities that could have caused catastrophic events.

End Permian Mass Extinction :

- End Permian, 251 million years ago, 96% of species lost
- Tabulate coral, 5 CM
- Known as “the great dying”, this was by far the worst extinction event ever seen; it nearly ended life on Earth.
- The tabulate corals were lost in this period – today’s corals are an entirely different group. What caused it? A perfect storm of natural catastrophes. A cataclysmic eruption near Siberia blasted CO2 into the atmosphere. Methanogenic bacteria responded by belching out methane, a potent greenhouse gas. Global temperatures surged while oceans acidified and stagnated, belching poisonous hydrogen sulfide.

Cause :

- Flood basalts are outpourings of molten rock that flow across Earth's surface. The largest flood basalts on Earth, called the Siberian traps, occurred during the end-Permian.
- They added enormous quantities of heat, CO2, and sulfur dioxide to the atmosphere. High levels of atmospheric CO2 trapped heat, causing intense global warming, the stratification of the oceans, and reaction of deep-ocean sulfur dioxide with water to form sulfuric acid, which is toxic to most organisms.
- Rocks that formed during the interval indicate that the oceans became completely or largely anoxic—meaning that they lacked oxygen.
- These conditions are fatal to organisms that rely on aerobic respiration.
- There is convincing evidence that sea level dropped dramatically during the extinction event, reducing the amount of habitat available for marine organisms.

- Terrestrial animals may have been restricted to small patches of low-elevation habitats, due to low oxygen concentrations and high CO_2 levels in the atmosphere.
- In short, both marine and terrestrial environments deteriorated dramatically for organisms that depend on oxygen to live. A prominent researcher has captured this point by naming the suite of killing mechanisms the “world went to hell hypothesis.”

End Triassic Mass Extinction:

- End Triassic, 200 million years ago, 80% of species lost
- Conodont teeth 1 mm
- Palaeontologists were baffled about the origin of these toothy fragments, mistaking them for bits of clams or sponges.
- But the discovery of an intact fossil in Scotland in the 1980s finally revealed their owner – a jawless eel-like vertebrate named the conodont which boasted this remarkable set of teeth lining its mouth and throat.
- They were one of the first structures built from hydroxyapatite, a calcium-rich mineral that remains a key component of our own bones and teeth today.
- Of all the great extinctions, the one that ended the Triassic is the most enigmatic. No clear cause has been found.

- Almost 65% of all living organisms were wiped out by a mass extinction event at the end of Triassic. However, unlike the end-Permian extinction, this was possibly a gradual process.
- The extinction was caused most likely by a *Climate change* event, possibly triggered by one or more volcanic erruptions that liberated a large amount of greenhouse gasses. However, the cause of this mass extinction is still a matter of debate due to the lack of direct evidence.

End Cretaceous Mass Extinction :

- End Cretaceous, 66 million years ago, 76% of all species lost
- Ammonite 15 cm length
- The delicate leafy sutures decorating this shell represent some advanced engineering, providing the fortification the squid-like ammonite required to withstand the pressure of deep dives in pursuit of its prey.
- Dinosaurs may have ruled the land during the Cretaceous period but the oceans belonged to the ammonites.
- But volcanic activity and climate change already placed the ammonites under stress.
- The asteroid impact that ended the dinosaurs' reign provided the final blow. Only a few dwindling species of ammonites survived

- The end-Cretaceous extinction of 65 million years ago. The impact hypothesis for the extinction of the dinosaurs, first put forth in the early 1970s by father-and-son team Luis and Walter Alvarez, proposed that an asteroid struck Earth and snuffed out an estimated 60–80 percent of the multicellular species alive.

Mass Extinction events at a glance :

Mass Extinction Event	Time Frame (mya)	Types of Life Effected
Late/End Ordovician	443 million years ago	Many species of Trilobites, Brachiopods, Graptolites, Echinoderms and Corals
Late/End Devonian	354 million years ago	Many marine families on tropical reefs, Corals, Brachiopods, Bivalves, Sponges
Late/End Permian	248 million years ago	57% of all marine families, Trilobites, Eurypterids, Mollusca devastated along with Brachiopods. Many vertebrates
Late/End Triassic	206 million years ago	Mollusca phyla, Sponges, marine vertebrates, large Amphibians, many Mammal-like Reptiles
Late/End Cretaceous	65 million years ago	Ammonites, Marine Reptiles, Dinosaurs, Pterosaurs, microscopic marine plankton, Brachiopods, Bivalves and Echninoderms

Sixth Mass Extinction :

- Are mass extinctions events of the distant past? Not likely. Many scientists now propose that life on Earth is on the verge of the sixth mass extinction, precipitated by human impacts such as habitat loss, pollution, overfishing, invasive species, and climate change. Could human activities really cause such dire consequences as massive as those caused by an asteroid impact?There is mounting evidence that the answer to this question is yes. The exponential increase of human populations, combined with our hunger for resources, has put the diversity of life as we know it at risk.

Happy reading

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