The Making of Mass Extinctions

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The Big Five Mass Extinctions

Extinction is a normal part of the evolutionary process and most species that have ever existed are not living today. The normal loss of species through time is generally balanced by the rise of new species. Mass extinctions, however, disrupt this balance—representing times when many more species go extinct than are replaced by new ones.

Scientists have found evidence of five mass extinction events during Earth's history. What caused these "Big Five" extinction events? And are we about to enter a sixth mass extinction?

The graph shows estimated rates of extinction plotted over geologic time. The fossil record reveals that these rates fluctuate around a generally low level, but peak at certain points in Earth's history, indicating mass extinction events.

The Sixth Mass Extinction?

A large number of current ecological threats have moved extinction rates above normal levels and potentially put numerous species on the path to extinction. If left unchecked, some scientists predict that within a few human generations, the sixth mass extinction will become inevitable.

END ORDOVICIAN EXTINCTION

Supercontinent moves to South Pole

Tectonic uplift and weathering

Environmental Factors

C^* Sea Lvl O_2

Glacial and interglacial episodes caused sea levels to rise and fall dramatically, moving shorelines repeatedly. Continental erosion changed atmosphere and ocean chemistry.

Affected Species (80% Extinct)
Trilobites, corals, brachiopods, bryozoans, echinoderms, graptolites, nautiloids, conodonts

LATE DEVONIAN EXTINCTION

Rapid growth of land plants

Environmental Factors

CO_2 C^* O_2

Land plants consumed atmospheric carbon dioxide (CO_2), which caused global cooling. Weathering plant roots released nutrients into the sea, causing algal blooms and oxygen depletion.

Affected Species (75% Extinct)
Armored fish, corals

END PERMIAN EXTINCTION


Massive volcanic activity in Siberia

Environmental Factors

CO_2 SO_2 pH C^*

Basalt lava covered vast areas of land. Huge clouds of sulfur dioxide (SO_2) and carbon dioxide (CO_2) caused acid rain, ocean acidification, and global warming.

Affected Species (96% Extinct)
Amphibians, early reptiles, insects, trilobites, sea scorpions, corals

TRIASSIC EXTINCTION

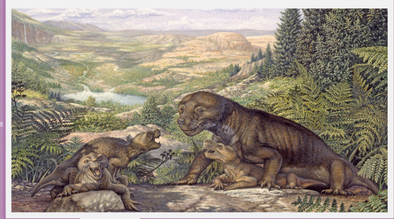
Underwater volcanic activity

Environmental Factors

CO_2 H_2S C^* pH

Atmospheric carbon dioxide (CO_2) levels rose, causing global warming and ocean acidification.

Affected Species (80% Extinct)
Amphibians, reptiles, bivalves, conodonts, corals, ammonites, brachiopods



CRETACEOUS EXTINCTION


Asteroid impact (Yucatán Peninsula, Mexico)

Environmental Factors

CO_2 pH O_2 C^*

Volcanic activity prior to impact acidified oceans and increased global temperatures. Tectonic uplift and erosion enriched oceans with nutrients and depleted them of oxygen. Asteroid impact caused brief superheating followed by rapid cooling and pushed already stressed species over the edge.

Affected Species (76% Extinct)
Dinosaurs, pterosaurs, mosasaurs, plesiosaurs, mammals, ammonites, shell-building species, plants

ANTHROPOCENE EXTINCTION?


Human activity

Environmental Factors

CO_2 SO_2 pH C^* Sea Lvl O_2

Many environmental factors linked to past extinctions exist today. Burning of fossil fuels, farming, and deforestation elevate carbon dioxide (CO_2) levels that cause ocean acidification, global warming, and rising sea levels. Pollutants alter the chemistry of the atmosphere, soil, and water; algal blooms deplete oceans and lakes of oxygen. Habitat loss, overfishing, and introduction of invasive species disrupt ecosystems and reduce biodiversity.

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