

Natural Disasters

Lecture 28

Ch #17 – The Great Dyings (Mass Extinctions)

Text Source Today:

Chapter #17 (p. 16-25)

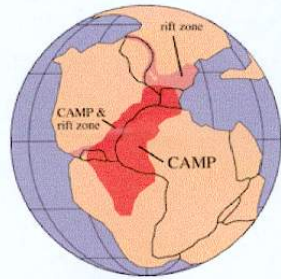
#17.3: Ch. #17 – The Great Dyings (Mass Extinctions)

Greenhouse Extinction

- ◆ Begins when Earth warms over short intervals of time due to a sudden increase of **carbon dioxide (CO₂)**, usually from **flood basalt** eruptions. The warmer Earth disrupts the positions of the **oceanic global conveyor**, as ocean winds diminish and surface currents come to a near standstill. Bottom ocean waters begin to have **warm, low-oxygen (anoxic)** water dumped into them.
- ◆ As warming continues, as much as **5°C** globally, the warmer oceans begin to release **methane (CH₄)** into the atmosphere, from the **frozen methane hydrates** on the ocean floor. This leads to intense global warming, up to an additional **5°C**.
- ◆◆ **Methane (CH₄)** is **21** times more effective than CO₂ as a “greenhouse gas.”
- ◆ As even shallower ocean water becomes anoxic, **green sulfur bacteria** (which thrive in the warm, low-oxygen ocean water) produce toxic amounts of **hydrogen sulfide (H₂S)** gas. This **poisonous gas** kills all marine life, before rising out of the sea and into the atmosphere, where it destroys the **ozone (O₃) layer**!
- ◆ The **high heat (10°C increase)**, the increased poisonous **H₂S gas** in the atmosphere, the destroyed **ozone layer**, and resulting increased **UV radiation** from the sun reaching the surface of the planet, all combine to kill any remaining life on land, including plant life.
- ◆ The result is a **global greenhouse extinction**!

► (4) **End Triassic:** occurred about **206 million** years ago, in less than 10,000 years, just before **Pangaea** began to break apart. The oceans had been full of invertebrate life and boney fishes, and on land, there were crocodiles, turtles, frogs, rodent-like mammals and **small dinosaurs**. At least **50%** of the species living on Earth at that time went extinct. **O₂** levels were at their lowest (**~12%**) since pre-Cambrian times and **CO₂** was high.

- **Cause:** is unknown, but may have been caused by the “**Central Atlantic Magmatic Province Flood Basalt (CAMP)**” eruption, which would have released tons of **CO₂** and possibly a tremendous amount of **methane** from frozen gas hydrates, leading to intense **global warming**, and perhaps a release of poisonous **H₂S** from the warm, **anoxic** oceans. Another **greenhouse extinction**?



- This event vacated ecological niches that allowed the **dinosaurs** to assume the dominant role in the **Jurassic** period!

► ♦ (5) **End Cretaceous (K-T boundary):** occurred **65 million** years ago, in a geologically short period of time. North America had been covered in herds of **large dinosaurs**. Some smaller **dinosaurs** had evolved into **birds**. The mammals were all small. In Late Cretaceous time, the first **flowering plants** had evolved. Then, over **65%** of all species went extinct, including major die-offs in the oceans, and on land, many species of reptiles, mammals and all the **dinosaurs (except birds)**. Land plant life also took a major hit.

- **Cause:** during the mid-Cretaceous (Fig. 16.21), the low elevated areas of the continents were flooded by inland shallow seas. During the final **18 million** years, **sea level fell**, climates **cooled**, vegetation suffered and animal life declined. Then, about **65 million** years ago, the **“Deccan Traps Flood Basalt”** erupted in **India** (which was just crossing the equator on its way toward Asia), causing similar cataclysmic effects as the **“Siberian Traps”** at the close of Permian time, setting the stage for yet another **greenhouse extinction!** Finally, the “*coup de grace*”, as a **10 km (6.2 mile) wide asteroid** impacted Earth near the **Yucatan** Peninsula. (Details on this in Ch. 17).
- This event allowed **mammals** to take over the land vacated by the **dinosaurs** and through evolution, to **us, Homo sapiens**.



Peter D. Ward, *“Out of Thin Air: Dinosaurs, Birds, and Earth’s Ancient Atmosphere,”* Joseph Henry Press, (2006).

[Read reviews or order this book safely from Amazon.com on-line book store.](#)

♦ **Living Fossils:** **not all species** went extinct during the so-called “mass extinctions.” Today we still find the **American horseshoe crab**, which has close relatives that lived 450 million years ago!



Sharks have been swimming the seas for over 350 million years! The dinosaurs went extinct, but not their closest relative, **birds**!

Cockroaches have been around for over 300 million years! Some trees and plants have been around for 235 to 275 million years! How and why did these survive?

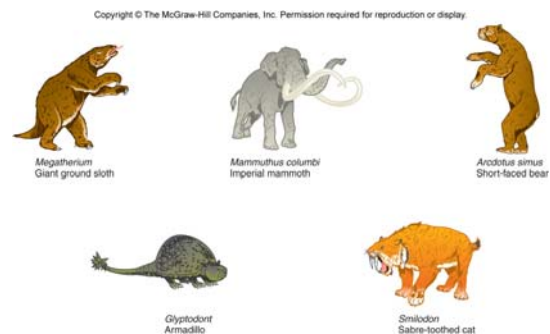


● **Quaternary Extinctions:** There have been significant die-offs of **large-bodied animals** in the last 1.5 million years. The advances and retreats of “**Ice Ages**” may have been responsible due to severe climatic changes, but there is a suspected additional cause, that being **Homo sapiens (us)**!

● Current **human-induced or -related causes** may be creating the “**6th Mass Extinction!**”

♦ “**The Last Extinction:**”

near the end of the last “**Ice Age**”, as the glaciers retreated about 12,900 years ago, three dozen groups of **mammals**, along with many groups of **large-bodied animals** (e.g., Imperial mammoth, giant ground sloth, sabre-toothed cat, American lion) all went **abruptly extinct**. Why?



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- **DVD: “*Last Extinction*”, NOVA, 2009**

◆ **Question #1:** What is the “black mat” that geologist Allen West discovered in southern AZ, near the Mexican border? What was directly below this “black mat?”

_____ **You must watch the video to get these answers!** _____

◆ **Question #2:** What evidence is under “lock and key” in the basement Archives of the Arizona State Museum?

_____ **You must watch the video to get these answers!** _____

◆ **Question #3:** What was the final conclusion as to what caused the “Last Extinction” of large-bodied animals and the Clovis people that inhabited North America 12,900 years ago? What is the “proof?”

_____ **You must watch the video to get these answers!** _____
