D17 Biology Evolution
Chicxulub Extinction


BBC

Cretaceous–Paleogene Extinction Event

the

Alvarez Hypothesis

and the

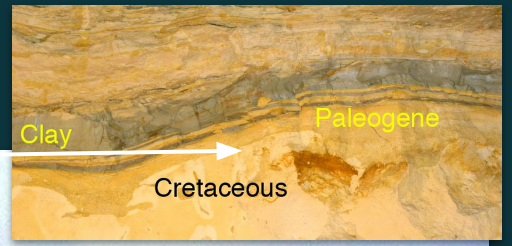
Chicxulub Impact Crater

Cretaceous–Paleogene Extinction Event

The Cretaceous–Paleogene (K–Pg) extinction event was a sudden mass extinction of three-quarters of the plant and animal species on Earth, around 65 million years ago.

In the geologic record it is marked by a thin layer of sediment called the K–Pg Boundary, which can be found throughout the world.

K-Pg Boundary
Previously called
K-T Boundary

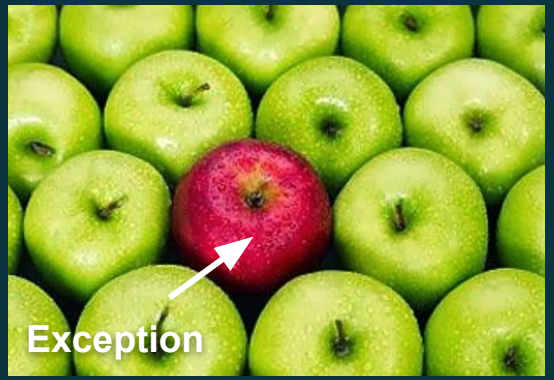


Badlands
Central Canada

Cretaceous–Paleogene Extinction Event

With the exception of some ectothermic species such as sea turtles and crocodilians, no tetrapods weighing more than 25 kilograms survived.

It marked the end of the Cretaceous Period and with it the Mesozoic era, and the beginning of the Cenozoic era which continues to this day.



All these apples are green, the red apple is the exception.

An ectothermic animals needs the Sun to get warm. Tetrapods are animals with four legs

Cretaceous–Paleogene Extinction Event

The K–Pg extinction event was severe, global, rapid. It appears to have affected all continents at the same time.

Non-avian dinosaurs that lived across North America, Europe, Asia, Africa, South America, and Antarctica were not present afterwards anywhere in the world.

Cretaceous–Paleogene Extinction Event

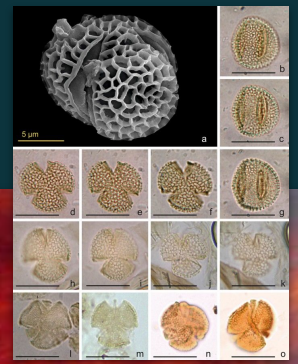
Omnivores, insectivores and carrion-eaters survived the extinction event perhaps because of the increased availability of their food.

No herbivorous or carnivorous mammals seem to have survived. Rather, the surviving mammals and birds fed on insects, worms, and snails, which in turn fed on the dead plants and animals.

Carrion is the rotting flesh of a dead animal. Many animals died either immediately or over time providing easy food for carrion-eaters.

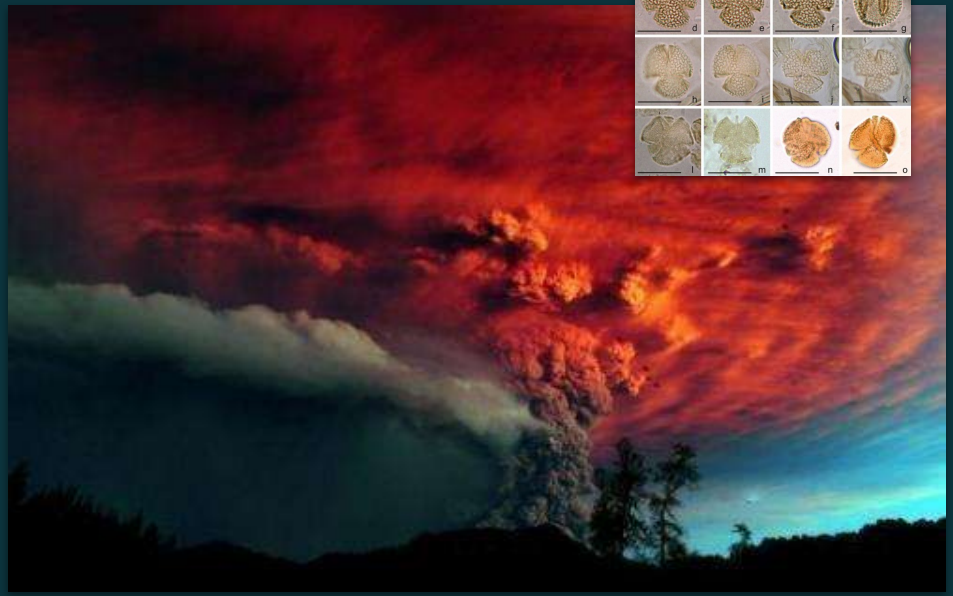
Cretaceous–Paleogene Extinction Event

Fossil Pollen



Fossil pollen shows devastation of the plant communities in areas as far apart as New Mexico, Alaska, China and New Zealand.

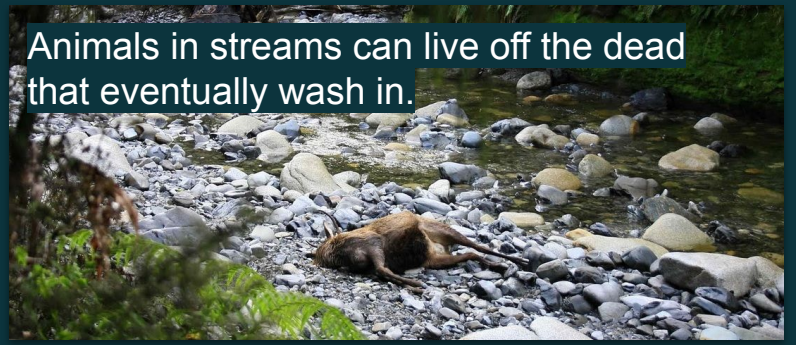
Plants that depended on photosynthesis declined or became extinct as atmospheric particles blocked sunlight and reduced the solar energy reaching the ground.



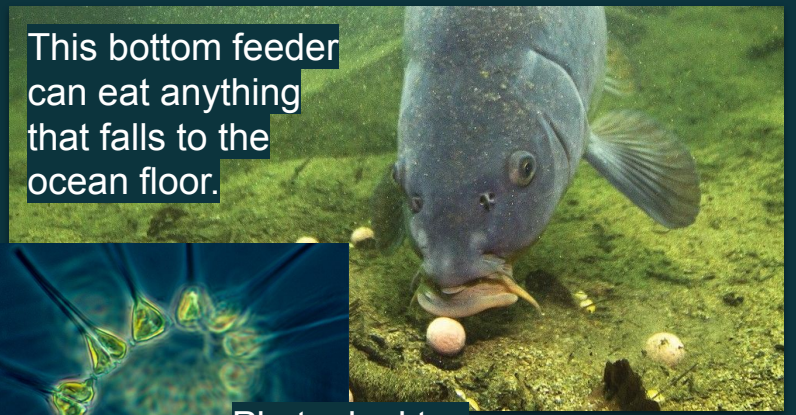
The Skies must have been full of ash, perhaps from a massive volcanic eruption.

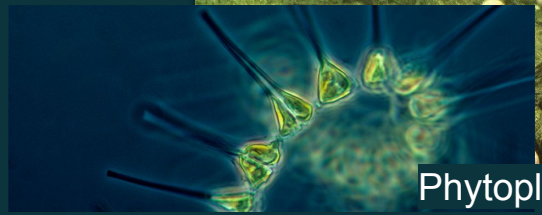
Cretaceous–Paleogene Extinction Event

In rivers and streams fewer animal groups became extinct probably because they can eat anything that is washed into the water.



In the oceans extinction was more severe amongst animals living in the water column, that eat phytoplankton, compared with those living on or in the sea floor that can live off dead things that fall to ocean floor.

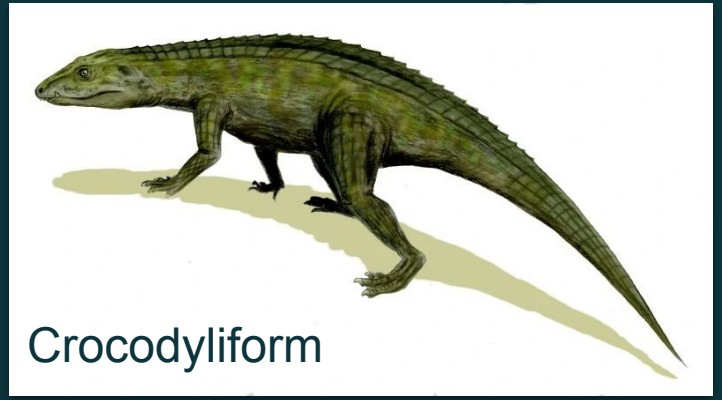


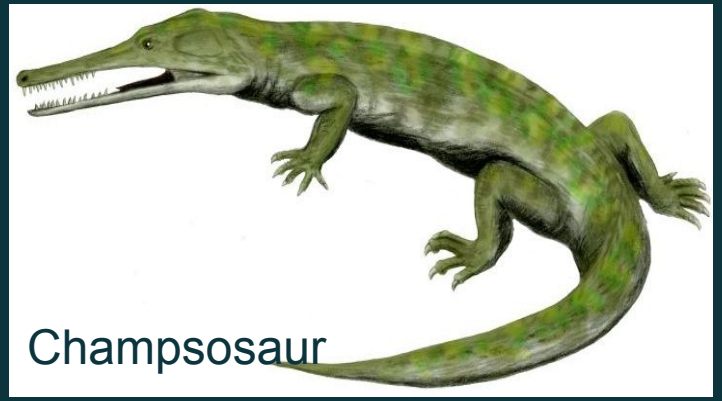

Phytoplankton

Cretaceous–Paleogene Extinction Event

The largest air-breathing survivors, crocodyliforms and champsosaurs, were semi-aquatic (lived in water and on land) and had access to detritus (dead things).

Modern crocodiles can live as scavengers and don't get sick from eating rotten meat, or survive for months without food. Their young are small, grow slowly and feed largely on invertebrates and dead organisms for their first few years.


Crocodyliform


Champsosaur

Cretaceous–Paleogene Extinction Event

Cretaceous–Paleogene Extinction Event

But

What Caused It?

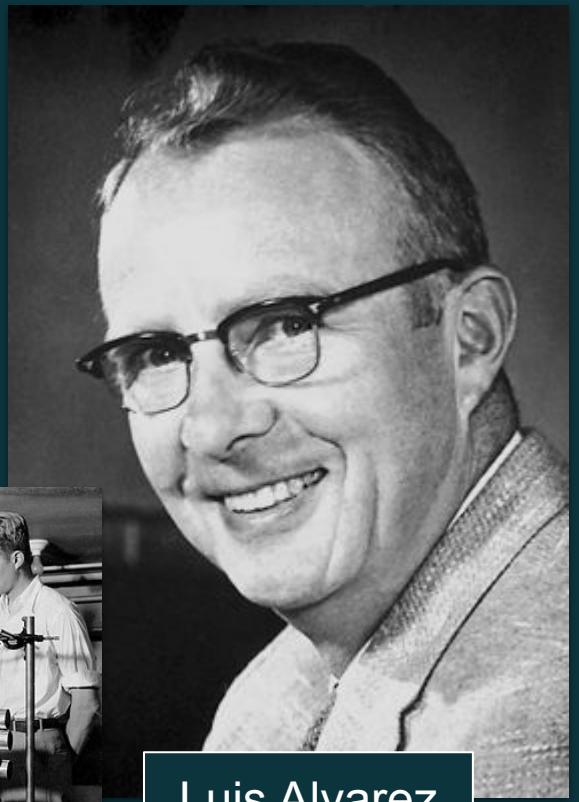
The Alvarez Hypothesis

Alvarez Hypothesis

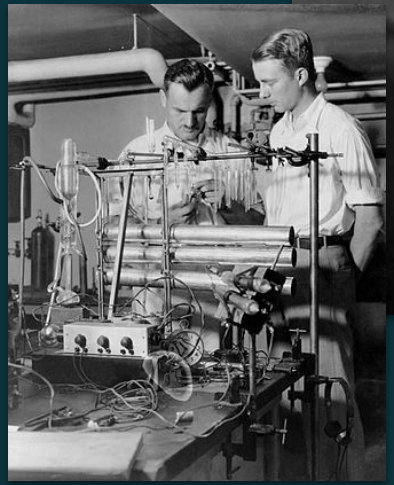
Luis Alvarez, born in 1911 in San Francisco, was a World famous American physicist, inventor and professor at the University of California, Berkeley.

He made many important discoveries and invented many machines used in both science and aviation.

He was awarded many medals and trophies and even the Nobel Prize in Physics in 1968. He died in 1988.



Luis Alvarez



Cretaceous–Paleogene Extinction Event

In the 1970's, his son, Walter Alvarez, a Professor of Earth Sciences also at Berkeley had been exploring rock strata in Italy with two colleagues, Frank Asaro and Helen Michel, and uncovered something that amazed the world.

They noticed a thin layer of rock between what was known to be Cretaceous and full of dinosaur fossils and the layer above where there were none.

They realised that something must have happened in between and wanted to know what.

Luis & Walter Alvarez

Alvarez Hypothesis

Walter turned to his father, Luis Alvarez, and the four of them worked on solving the problem.

Using his father's knowledge of nuclear chemistry along with that of Frank Asaro, Helen Michel and his own they were able to discover very high levels of a metal called Iridium in this layer.

Levels of Iridium like this are only found in asteroids and meteorites.

Iridium
A rare metal

Alvarez Hypothesis

They formulated a hypothesis.

A hypothesis is simply a suggestion of what happened based upon available evidence.

A hypothesis is not a fact, it is just a best guess based upon the evidence.

6 June 1980, Volume 208, Number 4448 SCIENCE

Extraterrestrial Cause for the Cretaceous-Tertiary Extinction

Experimental results and theoretical interpretation

Luis W. Alvarez, Walter Alvarez, Frank Asaro, Helen V. Michel

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microscopic floating animals and plants; both the calcareous planktonic foraminifera and the calcareous nannoplankton

extinctions (3, 4), and two recent meetings on the topic (5, 6) produced no sign of a consensus. Suggested causes include gradual or rapid changes in oceanographic, atmospheric, or climatic conditions (7) due to a random (8) or a cyclical (9) coincidence of causative factors; a magnetic reversal (10); a nearby supernova (11); and the flooding of the ocean surface by fresh water from a postulated arctic lake (12).

A major obstacle to determining the cause of the extinction is that virtually all the available information on events at the time of the crisis deals with biological changes seen in the paleontological record and is therefore inherently indirect. Little physical evidence is available, and it also is indirect. This includes variations in stable oxygen and carbon isotopic ratios across the boundary in pelagic sediments, which may reflect changes in

Alvarez Hypothesis

In 1980 they published their findings and the world was amazed.

They found lots of Iridium which only exists in asteroids, so there must have been a large asteroid that hit the Earth at this time and killed off the dinosaurs.

At first the geological community were skeptical, nobody wanted to believe what they claimed to have uncovered.

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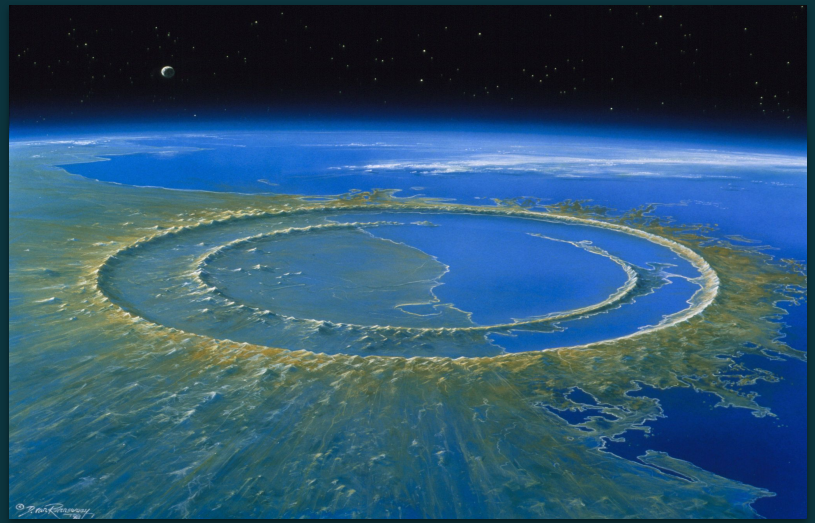
Chicxulub Impact Crater

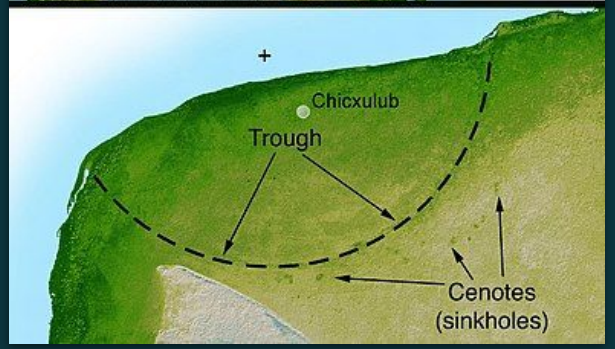
Ten years later, however, evidence of the Chicxulub impact crater off the coast of Mexico was revealed thus supporting their hypothesis.



Yucatan Peninsula

Chicxulub Impact Crater

180 km diameter
20 km deep




05. (K T) CRETACEOUS-TERTIARY
65 | MILLION B.C.


English with
2 Little Pigs
The End