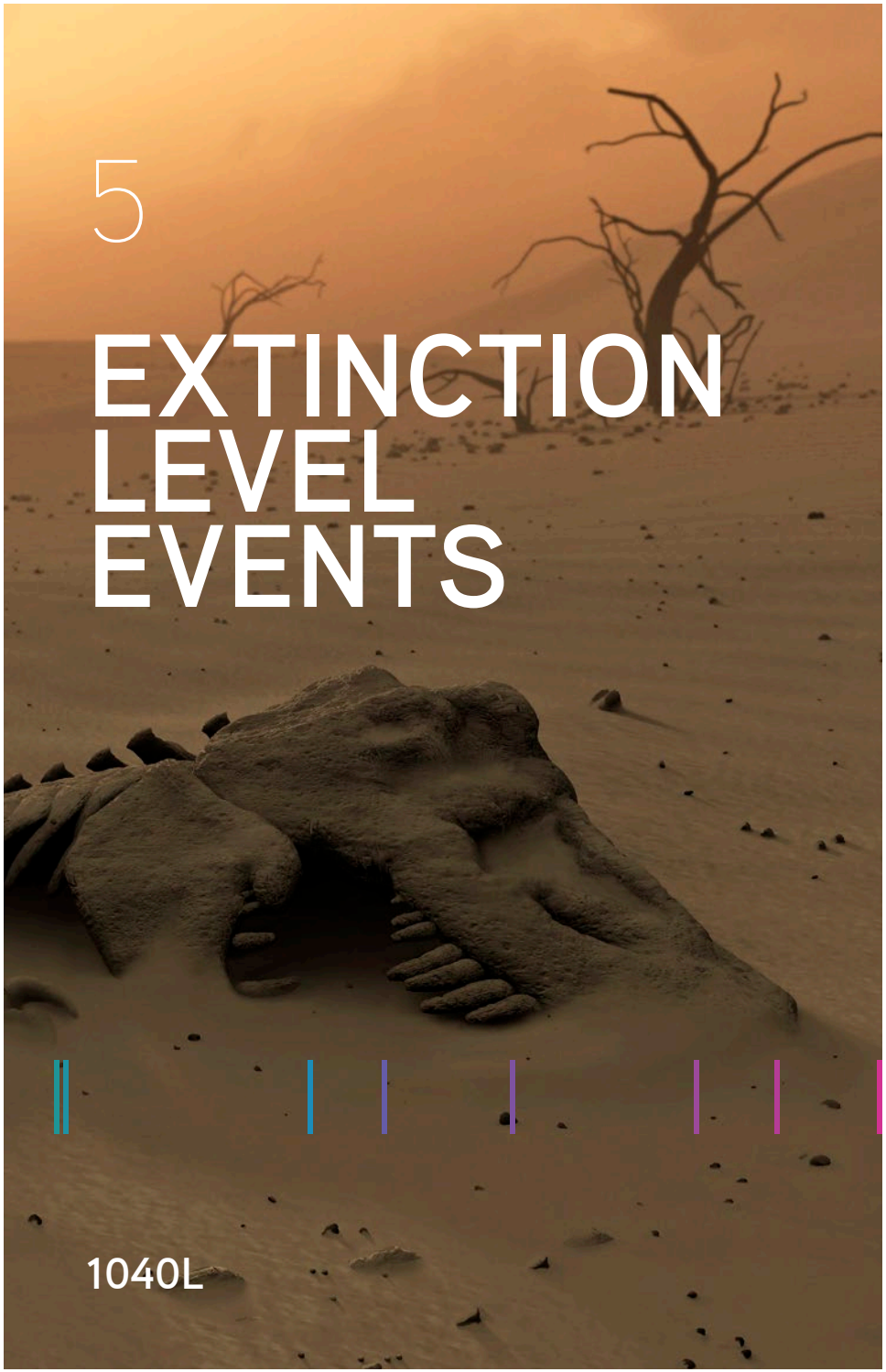
5

EXTINCTION LEVEL EVENTS



BIG HISTORY PROJECT

1040L

EXTINCTION LEVEL EVENTS

By Cynthia Stokes Brown, adapted by Newsela

Life on Earth has seen several periods when a large portion of its species died off. Yet, they've always led to a recovery and the rise of a newly shaped tree of life.

Volcanic activity is thought to have contributed to many of Earth's extinction events

Five major extinction events

An extinction event is a time in the Earth's history when many living organisms die off. Species are always going extinct, but during an extinction event, it happens much more quickly than usual.

Geologists and paleontologists study extinction events. They study sedimentary rocks to learn about the history of our planet. Marine fossils give them important clues about extinction events.

In the 1970s, scientists agreed that numerous extinction events had occurred. In the 1980s, scientists agreed on the five major ones.

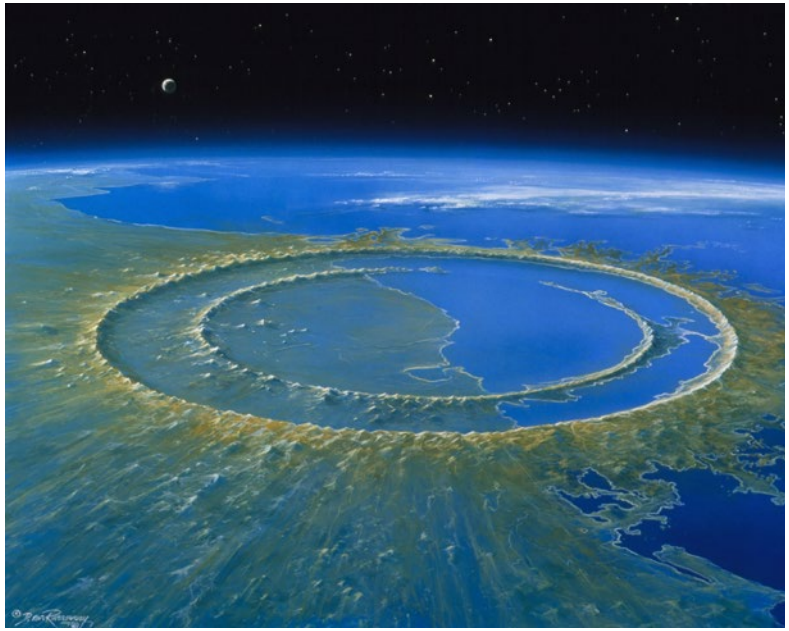
The "crater of doom"

One fine day about 65.5 million years ago, while dinosaurs were grazing and hunting around the world, an object the size of Mount Everest came flying through space. There were only seven minutes when the object's path could cross Earth's orbit.

The odds were against it, but the object hit Earth. It may have been a comet, made of dirty ice, or an asteroid, made of rock. The object landed just off the coast of what is now the Yucatán Peninsula in Mexico, traveling about 150 times as fast as a jet.

The impact made a hole the size of Belgium, throwing up debris that rose high into the atmosphere and circled around the Earth. The collision created so much heat that huge forests burned, sending more particulates into the atmosphere.

The Sun's rays were blocked by smoke and debris so photosynthesis slowed or stopped. The temperature cooled and the amount of rainfall decreased for a few months at least.



An illustration of the K-T impact crater

Plants and animals died. Almost all the dinosaurs died. Some avian dinosaurs survived. These were already evolving into birds. About 75 percent of all species disappeared.

Among the survivors were crocodiles, turtles, and small, rodent-like mammals, which were our ancestors.

Geologists call this extinction event the "K-T event" because it marked the end of one geologic period, the Cretaceous (spelled with a "K" in German), and the beginning of the next, the Tertiary.

The story of the K-T event is quite well understood thanks to years of patient detective work. In the mid-1970s, young geologist Walter Alvarez made a discovery in the mountains of Italy. He found a thin layer of clay a centimeter thick between the layers of Cretaceous and Tertiary limestone. The Cretaceous layer contained many marine fossils but the Tertiary layer had fewer.

In the layer of clay, Alvarez's associates found iridium. This element is extremely rare on Earth, but more common in meteorites. This suggested an impact by an asteroid or comet around the date of the extinction.

In 1980, Alvarez and his team reported that an asteroid or comet had hit and caused massive, rapid extinction by altering the air and water.

Within two years the evidence persuaded most geologists to accept this hypothesis. Others were unsure. If a massive asteroid or comet had hit, where was the crater? No known depression on land seemed large enough for such a massive object. It seemed the crater must be under water.

Large objects that hit water create huge tsunami waves, which leave telltale signs in the rock record, sometimes well inland from the coast. A worldwide search turned up evidence of such a large tsunami on the shores of Texas, across the Gulf of Mexico from the Yucatán Peninsula.

Much earlier, in 1950, geologists working for the Mexican national oil company, PEMEX, had mapped a 120-mile underwater crater, off the coast of the Yucatán Peninsula.

It wasn't until 1991 that the K-T researchers got in touch with the PEMEX geologists, who usually didn't publish their information. The K-T researchers realized that the "crater of doom" had been found. They named it Chixculub (a Mayan word pronounced cheek-shoe-lube), after the small coastal town nearby.

MASS EXTINCTIONS

1 2 3 4 5

THE FIVE MAJOR MASS EXTINCTION EVENTS

Other extinction events

Paleontologists and geologists have identified four other major extinction events. All of these came before the K-T extinction. Each is named for the geologic time it corresponds to. They are: the End-Triassic, the End-Permian, the Late Devonian and the Ordovician.

The End-Permian was the most massive of the five major extinctions. It was the mother of all extinction events.

In it, about 95 percent of marine species and 70 percent of land species were lost. The dying off lasted for 165,000 years and included both gradual and sudden environmental changes that greatly changed conditions on the Earth.

Very few creatures made it through the End-Permian extinction. Cockroaches did — and ginkgo trees and horseshoe crabs. So did our ancestors, small protomammals (early mammals) that had evolved from reptiles: they were furry and warm-blooded, but still laid eggs.

Possible causes of extinctions

Once most geologists and paleontologists agreed that the cause of the K-T extinction was an asteroid or comet hitting Earth, many of them hypothesized that objects from space had caused all the major extinctions.

That proved false. Studies of fossil layers from earlier extinctions showed that life forms had disappeared gradually, not suddenly, as they had in the K-T event.

The discussion about what causes mass extinctions continues. Scientists do not yet fully understand the reasons for them. Some possible explanations are:

- Sudden massive volcanic activity. Scientists have found huge lava plains that coincide with extinction events. Volcanoes emit carbon dioxide, which results in global warming. They also emit dust and aerosols that slow photosynthesis, causing food chains to collapse.
- Rapidly changing climate.
- Impact or multiple-impact events.
- Anoxic events (the middle or lower layers of ocean becoming deficient or lacking in oxygen).
- Changing position of oceans and continents (plate tectonics).

It seems likely that some combination of these causes may have taken place. One reputable paleontologist, Peter Ward, made the following hypothesis in 2006 to explain the four major extinctions other than the K-T event:

A “sudden” increase of carbon dioxide and methane in the atmosphere occurred, caused by vast volcanic lava beds. The warmer world disrupted ocean circulation patterns and currents. Without the mixing of the ocean layers, the bottom water became anoxic, without oxygen. This allowed green sulfur bacteria, which live on sulfur not oxygen, to expand. They produced hydrogen sulfide, which bubbled up, killing much of life and destroying the ozone layer, which protected life against ultraviolet rays from the Sun.

Ward’s discussion, and the conclusions of some other scientists, suggests that humans must reduce the carbon dioxide that we are emitting, or we may set off a similar chain of events.

A sixth major extinction?

Many biologists agree that a sixth major extinction is currently underway. This one is unique because it is the result of humans degrading and destroying the habitats of other life forms. This extinction apparently began about 50,000 years ago when humans moved into Australia and the Americas, causing the disappearance of many species.

No one knows how many species currently exist on Earth. The best estimate is about 8.7 million, not counting microorganisms. To date, only a small fraction of these estimated species have been identified, but new ones are constantly discovered and named.

It may seem that new species are appearing as fast as old ones are disappearing. A 2003 study by the World Conservation Union suggested that one in four known mammal species is threatened with extinction in the next several decades, while one in eight known bird species is at risk.

If the present trend continues, biologists fear that we could lose 50 percent of all known living species by the end of this century.

Sources

Alvarez, Walter. *T. Rex and the Crater of Doom*. Princeton, NJ: Princeton University Press, 1997.

Erwin, Douglas H. *Extinction: How Life on Earth Nearly Ended 250 Million Years Ago*. Princeton, NJ, and Oxford, UK: Princeton University Press, 2006.

Ward, Peter D. *Under a Green Sky: Global Warming, the Mass Extinctions of the Past, and What They Can Tell Us About Our Future*. New York: Smithsonian/HarperCollins, 2007.

Image credits

Dinosaur skeleton in the desert
© Mark Garlick/Science Photo Library/CORBIS

Sarychev Peak eruption, Kuril Islands, Russia
Image Science & Analysis Laboratory, Johnson Space Center/NASA

Artwork of the Chicxulub crater off the Yucatán Peninsula, Mexico
© Detlev van Ravenswaay/Photo Researchers, Inc.

NEWSELA

Articles leveled by Newsela have been adjusted along several dimensions of text complexity including sentence structure, vocabulary and organization. The number followed by L indicates the Lexile measure of the article. For more information on Lexile measures and how they correspond to grade levels: http://www.lexile.com/about-lexile/lexile-overview/

To learn more about Newsela, visit www.newsela.com/about.

The Lexile® Framework for Reading
The Lexile® Framework for Reading evaluates reading ability and text complexity on the same developmental scale. Unlike other measurement systems, the Lexile Framework determines reading ability based on actual assessments, rather than generalized age or grade levels. Recognized as the standard for matching readers with texts, tens of millions of students worldwide receive a Lexile measure that helps them find targeted readings from the more than 100 million articles, books and websites that have been measured. Lexile measures connect learners of all ages with resources at the right level of challenge and monitors their progress toward state and national proficiency standards. More information about the Lexile® Framework can be found at www.Lexile.com.