



## Museum of Natural History & Science Gallery Guide for *Lost Voices*

*Lost Voices* is a multi-part exhibit focusing on the varied life forms that have inhabited our planet in the past. This exhibit allows for a greater understanding of the history of our planet and also of our place on it.

**Concepts:** background extinction, Cenozoic, Cretaceous, crust, environment, eons, epoch, era, evolution, extinction, fossil, fossil record, geologic record, geologist, Holocene, Jurassic, limestone, mantle, mass extinction, Mesozoic, period, plate tectonics, Quaternary, sandstone, Tertiary, tilt, Triassic, wobble

### **Background Information:**

Scientists calculate the age of the Earth at approximately 4.6 billion years, and the planet has sustained life for over three billion years. During this time, many changes have taken place in climate, placement of the continents and life forms. To assist in understanding this vast period of time, scientists have divided the time into sections. The longest period of time are called **eons**, which are divided into **eras**, which are then divided into **periods**, which are finally divided into **epochs**. Most people are familiar with the **Mesozoic** era, which consists of the **Triassic**, **Jurassic**, and **Cretaceous** periods. We currently live in the **Cenozoic** era, the **Quaternary** period and the **Holocene** epoch.

The divisions between geologic time spans are often defined by a break in the **fossil record** or a geologic occurrence of some magnitude, such as a sudden widespread volcanic activity. For example, all available evidence points to the division of the Cretaceous and **Tertiary** periods caused by a giant asteroid strike off the coast of Mexico. The asteroid strike caused the extinction of over 80 percent of the planet's life forms and created widespread geologic activity.

The **geologic record** is one of the most important resources used by scientists in recreating the Earth of the past. Even though many rocks can take millennia to form, scientists can learn by watching current geologic occurrences. For example, watching how sand dunes and sandy coastlines form today can give insight into how sandstone formed during the Jurassic period. By studying the rocks of an area, **geologists** can piece together a picture of the area millions of years ago. Cincinnati is an excellent example as the underlying bedrock is **limestone**, which is formed from ocean deposits. Much of this limestone contains various marine **fossils**. From this data, scientists have determined that when those fossils were living organisms, Cincinnati was under a large inland sea. Because many of these organisms were coral-like, we can conclude that the sea must have been relatively shallow as these corals need good lighting and are not found at great depths.

One of the most basic lessons that studying the past can teach us is that change is inevitable. The greatest changes to the planet in the past 4.6 billion years have been in life forms, the placement of the continents and climate. These aspects are not independent of each other. Obviously the climate can affect living organisms. Less obvious is the effect of location of the continents on climate and life.

Life on the planet has been varied throughout time. Species adapt, or **evolve**, to best fit their **environment**. If they do not, they will become **extinct**. The average time span for a species is approximately two million years before it becomes extinct. There are two types of extinction: **background extinction** and **mass extinction**.

At one point in time not too long ago, it was thought that the position of the continents was forever fixed. However, during the 1960s, the scientific theory of **plate tectonics** was first developed. Over the years it has been refined and verified, but the underlying process remains the same. Simply put, the **crust** of the Earth is broken up into plates. These plates rest on the surface of the **mantle** and are in constant motion. As these plates shift about, they take with them the continents associated with them. While this movement is quite slow, over thousands to millions of year, the movement is quite evident and can completely change the environment.

Climatic changes can be caused for a number of reasons. The distance from the sun can cause average temperatures to rise or lower accordingly. Also, the placement of the continents may play a role in climatic change. If the continents are grouped together, it can influence the **tilt** and **wobble** of the Earth. Also, during every ice age that scientists have been able to study, a continent has been located on at least one pole.

### **Vocabulary:**

*Background extinction* – the general dying off of species that occurs naturally over time

*Cenozoic* – the current geologic era

*Cretaceous* – the last period of the Mesozoic era, from 144 to 65 million years ago

*Crust* – the outermost portion of the Earth, consisting of the continents and the sea floor bottom

*Environment* – the surrounding factors that act upon a living organism, such as soil, air and climate, as well as other life forms

*Epoch* – a division of geologic time characterized by a distinctive development or by a series of events

*Era* – a division of geologic time that is identified by some prominent characteristic, feature or stage of development

*Evolution* – the adaptation of species to better fit its environment

*Extinction* – a complete dying off of a species

*Fossil* – a remnant, impression or trace of an organism that has been preserved in the Earth's crust

*Fossil record* – a listing of all fossils found in the Earth's crust and all known data about those fossils

*Geologist* – a scientist who studies geology, the science of the history of Earth through its rocks

*Holocene* – the current epoch, extending to approximately 10,000 years ago

*Jurassic* – the second of three periods of the Mesozoic era, from 206 to 144 million years ago

*Limestone* – a sedimentary rock formed by the accumulated remains of organic marine reptiles

*Mantle* – the portion of the Earth directly under the surface crust

*Mass extinction* – the dying off of numerous species in a short period of time, often caused by a catastrophic event or by extreme over-hunting by humans

*Mesozoic* – the last era of geologic time, consisting of the Triassic, Jurassic and Cretaceous, from 245 to 65 million years ago

*Period* – a division of time longer than an epoch and included in an era

*Plate tectonics* – the scientific theory that states the crust of the Earth is divided into plates, which float on and travel independently over the mantle; much of the Earth's seismic activity occurs at the plate boundaries

*Quaternary* – the current geologic period, beginning 1.8 million years ago

*Tertiary* – the last geologic period, from 65 to 1.8 million years ago

*Tilt* – the angle of the Earth in relation to the sun

*Triassic* – the first of three periods of the Mesozoic, from 248 to 206 million years ago

*Wobble* – the irregular rocking of the Earth as it rotates

**Focus Questions:**

1. What is the cause of the most recent mass extinction? How is that different from previous mass extinctions?
2. Why is it important to study ancient history? Are there any lessons that we as humans might learn from previous life forms? Is it possible that we could also fall to the same fate as the dinosaurs?
3. Through this exhibit various reasons for mass extinctions have been proposed. What are your thoughts and theories for extinction?