

## Assignment Discovery Online Curriculum

**Lesson title:**

The Ice Age

**Grade level:**

9-12, with an adaptation for younger students

**Subject area:**

Life Science

**Duration:**

Three class periods

**Objectives:**

Students will

1. understand the difference between the terms *ice age* and *Ice Age*;
2. understand what causes ice ages;
3. learn about some plants and animals that lived during the Ice Age; and
4. understand why certain Ice Age animals became extinct.

**Materials:**

- Computers with Internet access (optional but very helpful)
- Pens and paper
- Copies of Classroom Activity Sheet: Learning about the Ice Age
- Copies of Take-Home Activity Sheet: Giving a Scientific Opinion

**Procedures:**

1. Ask students to brainstorm what they currently know about the Ice Age. What images come to mind? How did the Ice Age change Earth and its living things?
2. Then ask students how we have learned about the Ice Age. Help them understand that we learn about plants and animals from long ago by studying fossils. Make a class list of different kinds of fossils. Examples include bones, teeth, tusks, seeds, and even hair.
3. Tell students that they are going to conduct some research about the Ice Age and the animals that lived during that period. Divide students into five groups. Each group will be working on the three questions listed below. These questions are complex, so students may want to divide into subgroups in order to answer each part of the question. Visit the Web sites provided with each question for essential background information. Brief answers are provided in italics. Have students record their answers on the Classroom Activity Sheet: Learning about the Ice Age.

- a. What is an ice age? What does the term mean when it is capitalized (Ice Age)? When have ice ages occurred, and what has caused them to take place? (*Ice ages are periods of time when large areas of Earth's surface were covered with ice sheets. The term Ice Age refers to the last major glaciation that occurred in North America and Eurasia, from 2 million to 11,500 years ago, during the Pleistocene period. The movement of Earth's plates, reduction of carbon dioxide in the atmosphere, and changes in Earth's orbit are three major causes of ice ages.*)  
[http://museum.state.il.us/exhibits/ice\\_ages/](http://museum.state.il.us/exhibits/ice_ages/)
- b. What plants and animals lived during the Ice Age? How do we know about these animals? Give examples of where animal remains have been found and what they have taught scientists. (*Many different animals lived during the Ice Age. Among the more interesting are the mastodon, the mammoth, the saber-toothed tiger, the dire wolf, and the snowshoe hare. These animals have been found at several major excavation sites, including La Brea Tar Pits in Los Angeles, California, Eastside Reservoir Project in Hemet, California, and many sites throughout the Midwest. The remains have shown what these animals probably looked like and what they may have eaten. Plant remains located nearby reveal what the environment was like.*)  
<http://www.ucmp.berkeley.edu/quaternary/labrea.html>  
<http://more.abcnews.go.com/sections/scitech/mastodon710/index.html>  
<http://www.zoomdinosaurs.com/subjects/mammals/Iceagemammals.shtml>  
<http://museum.state.il.us/exhibits/larson>
- c. Why did many animals become extinct at the end of the Ice Age? (*Although scientists do not know for sure, they suspect the causes are either hunting by people or environmental changes as a result of the warming of Earth. Some researchers think that overhunting by humans eliminated a major species, either the mammoth or the mastodon, which led to more general extinction. Other scientists think that rising temperatures, changing rainfall patterns, and the melting of the glaciers caused many changes to the ecosystem, resulting in the extinction of certain animals.*)
- d. [http://museum.state.il.us/exhibits/larson/env\\_change\\_extinction.html](http://museum.state.il.us/exhibits/larson/env_change_extinction.html)  
<http://museum.state.il.us/exhibits/larson/overkill.html>
4. Have each group share its findings. What have students learned about the relationship between the environment of the Ice Age and the animals that lived then? What is the relationship between the changing environment of the Ice Age and the animals that became extinct?
5. Have students complete the Take-Home Activity Sheet: Giving a Scientific Opinion. The purpose of the sheet is to see whether students can apply what they have learned about the Ice Age to modern times. If possible, have students share their ideas with their classmates.

### **Adaptation for younger students:**

Younger students (middle school) can begin learning about the Ice Age by browsing the ThinkQuest Junior Ice Age site (<http://library.thinkquest.org/J001457>) or by looking in library resources. Review basic facts about ice ages and the Ice Age with students, such as what an ice age is and why they occur. (See question “a” in Procedures.) Then divide students into groups of two or three and have them research an animal that lived during the Ice Age. They can use library resources or the Web sites listed below. Have students draw a picture of the animal they selected and answer the following questions on a 4 \_ 6 index card: Where did this animal live? What did this animal eat? What animals were its predators? What descendants are living today? Ask each group to hang its illustration and index card on the bulletin board, creating an Ice Age mural.

#### **Sites about Ice Age Animals**

<http://www.tarpit.org>

<http://more.abcnews.go.com/sections/scitech/mastodon710/index.html>

<http://www.zoomdinosaurs.com/subjects/mammals/Iceagemammals.shtml>

<http://museum.state.il.us/exhibits/larson>

### **Questions:**

1. Explain how human life might be different today if the Ice Age were still at its peak, as it was 18,000 years ago.
2. Describe the ways in which the Ice Age changed the landscape of the present-day United States.
3. What do you think is the value of studying Ice Age fossils? What do you think they teach us about Earth today?
4. Compare and contrast Pleistocene mammals with mammals living today.
5. Discuss the reasons the mammoth and other Ice Age animals might have become extinct.
6. Describe the ways in which Ice Age animals were affected by the presence of humans.

### **Evaluation:**

Use the following three-point rubric to evaluate students' work during this lesson:

Three points: gave exemplary answers on the Classroom Activity Sheet; participated in class discussions; wrote clear and thoughtful responses to the questions on the Take-Home Activity Sheet.

Two points: made average effort to answer most or all of the questions on the Classroom Activity Sheet; participated in class discussions; wrote thoughtful responses to most or all of the questions on the Take-Home Activity Sheet.

One point: made minimal effort to answer questions on the Classroom Activity Sheet, leaving many or most of the questions blank; showed lack of interest in class discussions; performed weakly on the Take-Home Activity Sheet.

### **Extensions:**

#### **Ice Age Time Line**

Have students make a time line showing the four major periods of glaciation that occurred during the Pleistocene period. Their time line should also include the beginnings of human interaction with Pleistocene animals and the extinction of those animals. Students can get information for their time lines on the Web sites listed in this lesson.

#### **Paleontologists at Work**

Have students do some research about the work of paleontologists. Suggest that students investigate the tools used, how paleontologists protect specimens while transporting them to the lab, and what happens when the specimens arrive at the lab. The following Web sites provide useful information:

<http://www.tarpits.org/exhibts/fossils/excavation.html>

[http://museum.state.il.us/exhibits/larson/cave\\_visit/examine\\_bone.html](http://museum.state.il.us/exhibits/larson/cave_visit/examine_bone.html)

## **Suggested Reading:**

### ***Cloning***

Jeanne DuPrau. Lucent, 2000.

Cloning has seemed like science fiction for years (the re-creation of dinosaurs in the movie “Jurassic Park” for example), but when Dolly the sheep was created in 1996, it became a reality. This book explains how cloning is currently used in agriculture and how may be used in the future in such areas as medicine, the preservation of endangered species and even people. The ethics of cloning is covered as well in this good introduction to the subject.

### ***“The Cold Zone”***

Richard Stone. In Discover Magazine, February, 2000, pp. 58-65.

Follow an expedition of scientists as they look for the frozen remains of mammoths in the Taimyr Peninsula of Siberia. Over 1,000 mammoth specimens have been gathered here, including the famous Jarkov mammoth, which was raised from the permafrost in October of 1999. Scientists are hoping to find DNA evidence that will help explain the extinction of the mammoths, and perhaps lead to resurrecting them through cloning!

## **Vocabulary:**

### **glaciation**

Definition: The process by which glaciers spread over the land.

Context: We can see evidence of the **glaciation** that occurred during the Ice Age by looking at certain landscape features, such as the broad valleys of the northern United States.

### **Ice Age**

Definition: An ice age is a period in the Earth's history when ice sheets cover vast regions of land; when capitalized, the term refers to the Pleistocene glacial epoch, from 2 million to 11,500 years ago.

Context: The **Ice Age** ended about 11,500 years ago, when glaciers retreated significantly.

### **mastodon**

Definition: A large mammal, cousin to the elephant, that lived during the Pleistocene period.

Context: **Mastodons** looked very similar to woolly mammoths, but had shorter tusks and bodies.

### **paleontology**

Definition: The study of life from past geological times as known from fossil remains.

Context: The science of **paleontology** allows us to learn about the environment, animals, and plants of Earth millions of years ago.

### **Pleistocene era**

Definition: The time span from 2 million to 11,500 years ago.

Context: The end of the Ice Age coincides with the end of the **Pleistocene era**, both of which took place about 11,500 years ago.

**woolly mammoth**

Definition: A large mammal, cousin to the elephant, that lived during the Pleistocene.

Context: Many preserved specimens of the **woolly mammoth**, which became extinct at the end of the Ice Age, have been found in Siberia.

**Academic standards:**

**Grade level:**

9-12

**Subject area:**

Science

**Standard:**

Understands the nature of scientific knowledge.

**Benchmark:**

Understands how scientific knowledge changes and accumulates over time (e.g., all scientific knowledge is subject to change as new evidence becomes available; some scientific ideas are incomplete and opportunity exists in these areas for new advances; theories are continually tested, revised, and occasionally discarded).

**Grade level:**

9-12

**Subject area:**

Life Science

**Standard:**

Understands biological evolution and the diversity of life.

**Benchmark:**

Knows the history of the origin and evolution of life on Earth (e.g., life on Earth is thought to have begun 3.5 to 4 billion years ago as simple, unicellular organisms; cells with nuclei evolved about a billion years ago, after which increasingly complex multicellular organisms evolved).

**Grade level:**

9-12

**Subject area:**

Life Science

**Standard:**

Understands biological evolution and the diversity of life.

**Benchmark:**

Knows how natural selection and its evolutionary consequences provide a scientific explanation for the diversity and unity of past and present life-forms on Earth (e.g., recurring patterns of

relationship exist throughout the fossil record; molecular similarities exist among the diverse species of living organisms; the millions of different species living today appear to be related by descent from common ancestors).

**Credit**

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## Learning About the Ice Age

Work with your group to answer the questions below. Use library resources or the Web sites provided with each question. Continue your answers on the back of the page if you need more space.

1. What is an ice age? What does the term mean when it is capitalized (Ice Age)? When have ice ages occurred, and what has caused them to take place?

Web Site

<[http://museum.state.il.us/exhibits/ice\\_ages/](http://museum.state.il.us/exhibits/ice_ages/)>

2. What animals lived during the Ice Age? How do we know about these animals? Give examples of where animal remains have been found and what they have taught scientists.

Web Sites

<<http://www.tarpit.org>>

<<http://more.abcnews.go.com/sections/scitech/mastodon710/index.html> >

<<http://museum.state.il.us/exhibits/larson>>

<<http://www.zoomdinosaurs.com/subjects/mammals/Iceagemammals.shtml>>

3. Why did many animals become extinct at the end of the Ice Age?

Web Sites

<[http://museum.state.il.us/exhibits/larson/env\\_change\\_extinction.html](http://museum.state.il.us/exhibits/larson/env_change_extinction.html)>

<<http://museum.state.il.us/exhibits/larson/overkill.html>>

## Giving a Scientific Opinion

Imagine that you are a scientist studying global warming. You've been asked to speculate whether we are in the midst of a period of global warming. How could you tell whether we are in a period of global warming? (Hint: What did you learn about carbon dioxide levels during the Ice Age?) What effect do you think any environmental changes will have on animals living today? Do you think we should try to stop global warming? If so, what should we do?