Cincinnati Museum Center

Doing History

Thomas Jefferson and the Mastodon

OVERVIEW

Theme Introduction

In this unit, we're exploring the theme of "Doing History." How do we know what really happened in the past? How can we use multiple sources to form a better, more cohesive view of our history? How does science illuminate the history of life on Earth? We'll explore these questions and more.

Blog Post

Thomas Jefferson and the Mastodon with Dr. Glenn Storrs, Associate Vice President for Science & Research and Withrow Farny Curator of Vertebrate Paleontology at Cincinnati Museum Center.

Guiding Questions

As students read the blog post, invite them to consider the following questions:

- Why did Thomas Jefferson want to gather scientific evidence about animals in North America? Why was it especially important to find evidence of a large animal?
- Why is Big Bone Lick in Kentucky considered the birthplace of vertebrate paleontology in America?
- How did the fossils at Big Bone Lick help scientists draw conclusions about speciation and extinction?

Key Vocabulary

- **Naturalist:** A person who studies plants, animals and the natural world.
- **Enlightenment:** A European philosophy in the 1600s and 1700s that emphasized rationality and one's power to use reason to make sense of the world.
- **Renaissance:** A period of innovation in culture, art and learning between the 1300s and 1500s that started in Italy and spread across Europe.
- **American Degeneracy:** A theory from the 1700s that claimed that the Americas' cold, damp climate caused organisms there to be smaller, weaker and less developed than their European counterparts.
- **Scientific Method:** A way of investigating the world that uses observations, measurements and experiments to form, test and modify hypotheses.
- **Paleontology:** The branch of science concerned with fossil animals and plants.
- **Extinction:** The complete dying out of a species.
- **Comparative Morphology:** The study of similarities and differences in organisms' bodies to understand their evolutionary relationships.
- **Deist:** Someone who believes in a single god who created the world but does not act to influence events.

ACTIVITIES

Rediscovered: Lazarus Species

Recommended for grades 4-8

We read in the blog that Thomas Jefferson believed the American Mastodon might still exist in unexplored parts of the continent. While Jefferson's hope was unfulfilled, the idea that a species thought to be extinct could still survive is a scientific phenomenon. In this activity, students will research an organism once thought extinct that actually still lives today.

Review that Jefferson hoped Clark would discover living "mammoths" – a name they used for the animal we now know as the mastodon. Ask students whether Clark's expedition discovered any large living creatures, such as the ground sloth, mastodon or mammoth? Why not? Review the concept of extinction: those species lived during the Pleistocene Epoch and have been extinct for about 10,000 years. While these large creatures only exist as fossils, there have been other organisms throughout history – called "Lazarus species" – that people believed extinct but found alive later. Some of these species were rediscovered after people thought they were extinct for decades or even centuries! Invite students to research a Lazarus species of their choosing.

Ask students to choose an organism (examples below) once incorrectly thought to be extinct. Instruct them to research its history, including:

- Where did it live, and where was it last seen?
- When was it declared extinct?
- When and where was it rediscovered, and who made that discovery?
- What is its status today?
- What did it look like? Locate a photo or drawing if possible.

After students gather information about their Lazarus species, ask them to write a newspaper article reporting on its rediscovery. Invite them to choose an attention-grabbing headline and include the information above in their story, along with any other interesting facts about their species.

Lazarus species:

- Bermuda petrel
- Takahe
- Cuban solenodon
- Cone-billed tanager
- Fernandina rice rat
- Wollemi pine
- Lord Howe Island stick insect
- Mahogany glider
- Majorcan midwife toad
- Large-billed reed warbler
- Fernandina giant tortoise
- Boucort's terrific skink (aka Terror skink)
- Coelacanth
- Attenborough's long-beaked echidna
- Wallace's giant bee
- Australian night parrot
- Black-footed ferret
- Velvet pitcher plant
- Crested gecko
- Omilteme cottontail rabbit
- De Winton's golden mole
- Wood's hau kuahiwi
- Fagilde's trapdoor spider
- Jackson's climbing salamander
- Somali sengi
- Silver-backed chevrotain
- Voeltzkow's chameleon
- Sierra Leone crab
- Big puma fungus

Research site suggestions:

- World Heritage Site: https://www.worldheritagesite.org/connections/lazarus-species/
- PBS: https://www.pbs.org/wgbh/nova/article/eight-extinct-species-rediscovered/
- World Economic Forum: https://www.weforum.org/stories/2020/08/lazarus-species-extinction-discoveries-conservation/
- National Geographic: https://www.nationalgeographic.com/travel/article/visit-animal-species-back-from-dead-lazarus-taxon
- Re:wild: https://www.rewild.org/lost-species/lost-species-found

Optional Extension: Compile students' articles into a class nature journal about Lazarus species.

Comparative Morphology: Tooth Edition

Recommended for grades 5-9

In the blog post, we learned about the early practice of comparative morphology, a way to determine species relationships by comparing organisms' physical characteristics. In this activity, students will use comparative morphology to contrast species collected at Big Bone Lick with a modern relative.

Review what comparative morphology is. Before they could analyze DNA, scientists compared physical features to form hypotheses about speciation, extinction and the evolutionary relationships between organisms. Fossils help us compare extinct organisms with possible living ancestors.

From the blog, we learned that explorers and scientists collected many fossils at Big Bone Lick. Ask students to recall the type of animal that most caught Jefferson's interest. Clark collected bones, teeth and tusks of multiple elephant-like animals and sent them to Jefferson and several other scientists and scholars for study. Invite students to take on the role of those scientists today, comparing sets of teeth from organisms found at Big Bone Lick with a set of teeth from a modern descendant of these species.

Give students the three large images and Venn diagram below. Emphasize that in comparative morphology, it is important to compare the same structure across species. Ask students to observe similarities and differences among the three different sets of teeth, paying close attention to shape, size, number and surface patterns. If needed, share how a Venn diagram works and ask students to place their tooth observations into the right portion of the diagram. Invite a class discussion to share students' thoughts and ask the following questions:

- Did all three sets of teeth have any characteristics in common?
- Which two sets of teeth look most similar to one another, and in what ways?
- What type of diet do you think each of the three animals had?

Reveal the identities of the three sets of teeth: 1) Woolly mammoth, 2) American mastodon and 3) Asian elephant. Ask students the following questions:

- Would you conclude that the modern Asian elephant is a different species than the other two species?
- Would you conclude that the Mammoth and Mastodon were separate species?
- Which of the Pleistocene species do you think is more closely related to the Asian elephant? How did you draw this conclusion? Which morphological characteristics helped you make this decision?

Wrap up by revealing that we do know that the Woolly mammoth is the closer relative of the Asian elephant. Show students the simplified cladogram of this group of animals (below), describing this chart as similar to a family tree, where things grouped on branches together are most closely related. Ask students what additional tools science has today that complement comparative morphology and let us confirm these relationships.

Images:

- American mastodon teeth, Cincinnati Museum Center (Page 4): https://searchcollections.cincymuseum.org/public/museum/Portal/Sharelink.aspx?component=AAAE&record=96d3bd2d-0e8b-44bb-bebb-a9193060a6f0
- Woolly mammoth teeth, Cincinnati Museum Center (Page 5): https://searchcollections.cincymuseum.org/public/museum/Portal/Sharelink.aspx?component=AAAE&record=18cffd23-5473-453a-90c2-f1ac5dcd5627
- Asian elephant teeth, Cincinnati Museum Center (Page 6): https://www.cincymuseum.org/wp-content/uploads/2026/01/ThomasJeffersonAndMastadon-AsianElephantTeeth.jpg
- Venn Diagram Worksheet: See Page 7
- Cladogram: See Page 8

American mastodon teeth, Cincinnati Museum Center

Woolly mammoth teeth, Cincinnati Museum Center

Asian elephant teeth, Cincinnati Museum Center

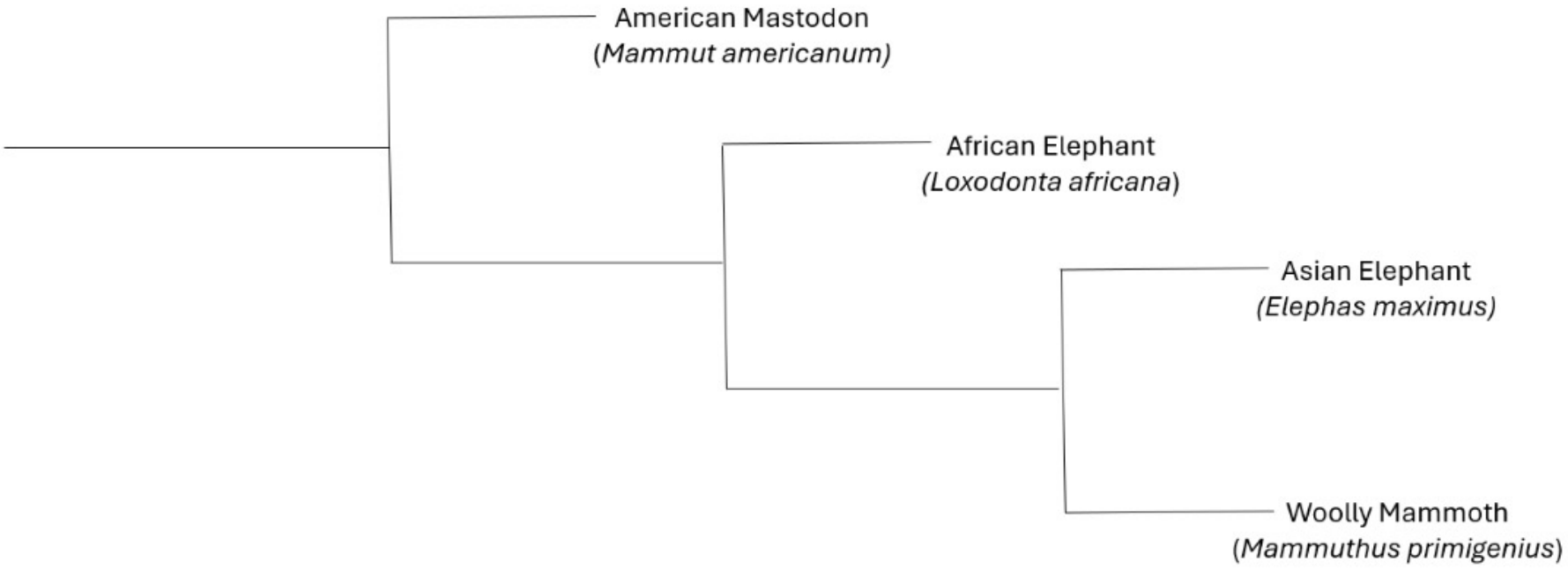
2.

1.

Venn Diagram Worksheet

3.

Cladogram


American Mastodon
(Mammut americanum)
African Elephant
(Loxodonta africana)
Asian Elephant
(Elephas maximus)
Woolly Mammoth
(Mammuthus primigenius)

Letters From the Dig

Recommended for grades 6-10

The blog post mentions an important letter from William Clark to James Findlay during the 1807 paleontology expedition at Big Bone Lick. This letter is an important record of fossils found at the site, and of Jefferson's quest for scientific evidence to challenge the idea of "American degeneracy." In this activity, students will use primary sources to draw conclusions as they read and analyze the contents of two letters sent from Big Bone Lick.

Show students the location of Big Bone Lick, KY, on the map below. Review why William Clark was at Big Bone Lick in 1807 and who sent him. Mention that Clark wrote several letters during his time there, which provide an important record of his findings. Invite students to examine two letters from this dig. Hand out or display the image of the actual letter written to James Findlay, former Mayor of Cincinnati. Ask students to identify:

- Who wrote the letter
- When the letter was written
- Where the letter originated

Next, pass out or display the transcript of the letter (below). Invite students to share what they learned and think through the following questions:

- How long had Clark been at Big Bone Lick when he wrote this letter?
- What animal species did Clark set out to collect?
- What did he actually collect?
- What body parts were represented in the collected fossils?
- What does Clark express some anxiety or disappointment about?

Now, let students read the transcript of the second letter, sent to Thomas Jefferson. Review the questions above, and where, when and by whom the letter was sent. Remind students that Jefferson promoted the scientific method and wanted people to use evidence and reason to draw conclusions. Review which discoveries of new specimens had been made since the first letter was sent and how Clark seems to feel about them. Discuss the following questions:

- Why do you think Clark collected so many specimens of the same species?
- What observations does Clark make, specifically about the bones of the "Mammoth" and "Eliphant," in this second letter? What conclusions does he suggest as a result of these observations?
- Do you think this expedition to Big Bone Lick provided evidence that disproved American degeneracy? In what way?
- Did the expedition's findings provide support for both speciation and extinction of animals in North America?
- Why do we find so many specimens preserved at Big Bone Lick?

Remind students that these letters document early scientific investigation in America. The specimens described here helped grow the study of comparative morphology. By studying the differences among the teeth, tusks and ribs of the two elephant-like animals found at Big Bone Lick, scientists concluded that they were indeed two distinct species, now known as the American mastodon (which Clark called "Mammoth") and the Woolly mammoth (which Clark called "elephant").

Optional Modification for Younger Students: After reading the letters, invite students to imagine that they are part of William Clark's excavation at Big Bone Lick in 1807. Invite them to write a detailed letter to a friend – in their own words – describing what they have discovered during the dig. Encourage students to picture themselves working alongside Clark as he gathers bones, teeth and tusks from mastodons and other extinct creatures. Their letter should include vivid descriptions of the fossils they collected and how it felt to see such enormous specimens for the first time. It should also share what they plan to do with the fossils following the dig.

Map: See Page 10

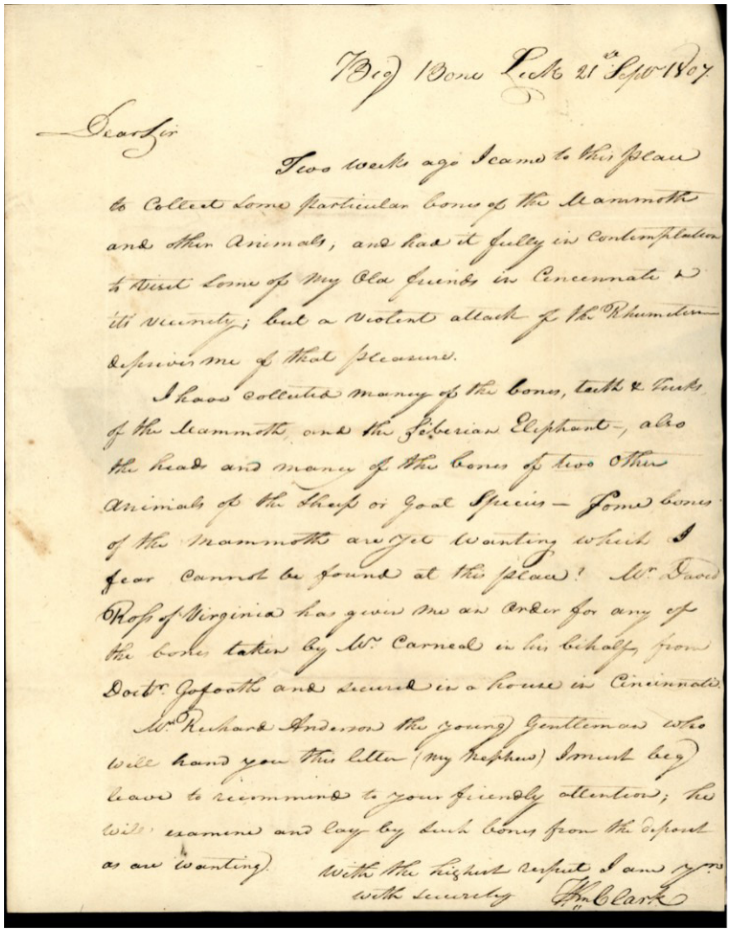
Letter to James Findlay:

- Cincinnati Museum Center (See Page 11): https://www.cincymuseum.org/wp-content/uploads/2026/01/ThomasJeffersonAndMastadon-LetterToFindlay.jpg

Transcribed text of letter to Jefferson:

- National Archives: https://founders.archives.gov/documents/Jefferson/99-01-02-6754

Letter to James Findlay



Big Bone Lick 21st Sept 1807

Dear Sir

Two weeks ago I came to this place to collect some particular bones of the Mammoth and other Animals, and had it fully in contemplation to visit some of my Old Friends in Cincinnati & its vicinity; but a violent attack of the Rhumatism deprives me of that pleasure.

I have collected many of the bones, teeth & Tusks of the Mammoth, and the Siberian Elephant -, also the heads and many of the bones of two other animals of the Sheep or Goat Species – Some bones of the Mammoth are yet wanting which I fear cannot be found at this place? Mr. David Ross of Virginia has given me an order for any of the bones taken by Mr. Carneal in his behalf, from Doctr. Goforth and secured in a house in Cincinnati.

Mr. Richard Anderson the young Gentleman who will hand you this letter (my nephew) I must beg leave to recommend to your friendly attention; he will examine and lay by such bones from the deposit as are wanting.

With the highest respect I am yours
with security Wm Clark

Transcribed text of letter:

Storrs, G.W., McDonald, H.G., Scott, E., Genheimer, R.A., Hedeen, S.E., Schwalbach, C.E, 2023, Field Guide to Big Bone Lick, Kentucky: Birthplace of American Vertebrate Peleontology: Kentucky Geological Survey, ser. 13, Special Publication 2. https://uknowledge.uky.edu/cgi/viewcontent.cgi?params=/context/kgs_sp/article/1000/&path_info=GSA_Field_Guide_Final_10.12.23.pdf

General Findley [sic]
Cincinnati
Big Bone Lick 21st Sept 1807

Dear Sir
Two weeks ago I came to this place to collect some particular bones of the Mammoth and other animals; and had it fully in contemplation to visit some of my old friends in Cincinnati & it's [sic] vicinity; but a violent attack of the Rhumatism [sic] deprives me of that pleasure.

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STANDARDS CONNECTIONS

- **OH 4.LS.2:** Fossils can be compared to one another and present-day organisms according to their similarities and differences.
- **OH 8.LS.1:** Diversity of species, a result of variation of traits, occurs through the process of evolution and extinction over many generations. The fossil records provide evidence that changes have occurred in number and types of species.
- **OH 8.LS.2:** Every organism alive today comes from a long line of ancestors who reproduced successfully every generation.
- **OH HS.B.E.2:** Classification systems are frameworks, developed by scientists, for describing the diversity of organisms; indicating the degree of relatedness among organisms. Recent molecular sequence data generally support earlier hypotheses regarding lineages of organisms based upon morphological comparisons. Both morphological and molecular comparisons can be used to describe patterns of biodiversity (cladograms present hypotheses to explain descent from a common ancestor with modification). The concept of descent from a common ancestor with modification provides a natural explanation for the diversity of life on Earth as partially represented in the fossil record and in the similarities of existing species.
- **KY 4-LS4.A:** Some kinds of plants and animals that once lived on Earth are no longer found anywhere. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.
- **KY 8-LS4.A:** Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.
- **KY HS-LS4.C:** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.