

ScienceNews

EDUCATOR GUIDE



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**The Age of Dinosaurs
May Have Ended in Springtime**



About this Guide

In this Guide, based on the online *Science News* article "[The Age of Dinosaurs may have ended in springtime](#)," students will answer claim, evidence and reasoning questions about how scientists used fossilized fish to determine what season it was when an asteroid wiped out nonavian dinosaurs. They will then explore the physical properties of human bones and how bones offer evidence to support scientific claims.

This Guide includes:

Article-based Comprehension Q&A — Students will answer claim, evidence and reasoning questions about the online *Science News* article "[The Age of Dinosaurs may have ended in springtime](#)." The article describes how scientists used fossilized fish to determine what season it was when an asteroid wiped out nonavian dinosaurs. Related standards include NGSS-DCI: HS-LS2; HS-LS4.

Student Comprehension Worksheet — These questions are formatted so it's easy to print them out as a worksheet.

Cross-curricular Discussion Q&A — Students will discuss the physical properties of human bones and how bones can offer evidence to support scientific claims. Then students can search *Science News* for examples of how bones have been used as evidence. Related standards include HS-LS2; HS-LS4; HS-LS1.

Student Discussion Worksheet — These questions are formatted so it's easy to print them out as a worksheet.

Article-based Comprehension, Q&A

Directions for teachers: Ask students to read the online *Science News* article "[The Age of Dinosaurs may have ended in springtime](#)," which describes how scientists used fossilized fish to determine what season it was when an asteroid wiped out nonavian dinosaurs, and answer the following questions. A version of the article, "Dinosaur killer may have hit in spring," appears in the March 26, 2022 issue of *Science News*.

1. A claim is an assertion of something as a fact. What is one scientific claim made by scientists in the article?

The asteroid that killed the nonavian dinosaurs happened in Northern Hemisphere springtime.

2. Claims often serve as answers to questions. What scientific question might the scientists' claim attempt to answer?

When exactly did the asteroid that killed the dinosaurs strike Earth?

3. Evidence is the scientific data that are given to support a claim. What information do the scientists give as evidence?

Scientists examined the jawbones and fin bones of fish that died in the impact's aftermath. Solidified globs of molten and vaporized rock in the animals' gills indicate the fish were alive when the asteroid hit. The bones show signs that at the time of death, the fish were in the middle of a rapid growth cycle.

4. Reasoning is the explanation of why the evidence supports the claim. What reasoning is given by the scientists?

For these fish, previous rapid growth cycles peaked around summertime. Since the fish were in the middle of a growth cycle when they died, that points to springtime as the season of the impact.

5. Who did the research? What is their expertise?

Melanie During and her colleagues did the research. During is a vertebrate paleontologist at Uppsala University in Sweden. She studies ancient animals with backbones.

6. Who else is quoted in the article? What do they say about the findings and how does that contribute to your understanding?

Stephen Brusatte is quoted in the article. He also is a vertebrate paleontologist but was not involved in

the research. In his opinion, the evidence that During's team presents provides strong scientific support for the team's claim.

Student Comprehension Worksheet

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5. Who did the research? What is their expertise?

6. Who else is quoted in the article? What do they say about the findings and how does that contribute to your understanding?

Cross-curricular Discussion, Q&A**Directions for teachers:**

Ask students to answer the first set of questions about the physical properties of human bones, looking up information as needed. Then have students read the online *Science News* article "[The Age of Dinosaurs may have ended in springtime](#)" and optionally answer the comprehension questions, followed by the second set of questions below, about bones as evidence. The last prompt can be used as an individual or group extension.

Want to make it a virtual lesson? Post the online *Science News* article to your virtual classroom. Discuss the article and questions with your class on your virtual platform.

Understanding human bones

1. Name the two types of bone tissue. How do they differ?

The two types of bone tissue are compact tissue and spongy, or cancellous, tissue. They differ in their density: Compact tissue is denser, and therefore harder, than spongy tissue.

2. What are bones made of? Name a few physical properties of bones based on their makeup?

Bones are made of mostly collagen, a protein composed of three polypeptide chains wound together in a triple helix. Collagen provides a soft framework, and calcium phosphate strengthens that framework. This chemical makeup gives bones a strong yet flexible structure.

3. What is the process by which human bones grow? Do they stop growing at some point?

Bones grow through the process of ossification, or the replacement of soft cartilage with bone. The process of ossification is generally complete by a person's mid-20s. After that, bone tissue can be remodeled, responding and adapting to changes in the body. In remodeling, bone cells called osteoclasts dissolve bone and bone cells called osteoblasts form new bone.

4. Compare human bones with the bones of other animals. Name at least two differences.

While human bones and the bones of other animals can be made of the same materials, they often differ in shape, size and density. The most obvious difference is the overall skeletal structure. Human skeletons have several distinct characteristics, including chinbones in the skull, a dish-shaped pelvis, a flat rib cage, an S-curved spine and an arched foot bone. As for individual bones, the bones of nonhuman animals tend to be denser than human bones.

Using bones as evidence

1. Based on the example in the *Science News* article, name two reasons why bones are a good source of evidence about past events?

Bones are a good source of evidence because they are often preserved as fossils. Bones also capture information about an organism and its environment as they grow. Fossils can therefore be studied to learn more about the organism, such as when and how it died.

2. Why do you think bone decomposes at a slower rate than other types of tissue? Refer to your answer to question 2 in the previous section to help you think about environmental factors that might speed up bone decomposition.

Student answers will vary but could include that the collagen in bone is resistant to enzymes that break down other types of protein. Bone also contains high quantities of calcium phosphate, which is insoluble in water. If bones are exposed to open air or humid or acidic conditions, decomposition occurs at a faster rate. Exposure to insects or other animals might also speed decomposition.

3. What evidence can bones provide about the human body? What types of claims could that evidence support?

Bones can be used to determine sex, age and stature. They can tell us about diet during the time of their formation and about diseases that were present in the body. They can give clues to when a person lived. Bones can also reveal any recent or long-ago trauma. These data could support claims of identity, timing, diet, cause of death and so on.

4. Thinking beyond the individual, what can bones reveal about environment, ecology or evolutionary relationships?

Student answers will vary but could include that bones can record signatures of the environment, including where a person grew up and what they ate, and so what kind of food was available in the environment. Because bones incorporate material from the environment, they can give clues to the level of pollution present. Where bones are found can reveal how habitable a place was at a given time and to what kind of life. And where bones show up in relation to other bones and what artifacts are found nearby can offer clues to ecological, social and cultural relationships. Scientists can also compare bones to try to understand how humans and other organisms have evolved through time.

Dig into the issue

Look through the March 26, 2022 issue of *Science News*, either in print or the [digital issue](#). Find another article that gives an example of how bones were used as evidence to support a scientific claim.

Summarize the article and explain how bones were used as evidence. Note: You can also perform an archive search at www.sciencenews.org using “bones” as a search term.

Student answers will vary. One possible answer from the March 26 issue is the Science News article “A crocodile ancestor dined on dinos,” which reports on dinosaur remains found in the stomach of a fossilized crocodyliform. In this case, the bones were evidence that an ancient crocodile ancestor ate dinosaurs.

Student Discussion Worksheet

Directions: Answer the first set of questions below. Then, after reading the online *Science News* article "[The Age of Dinosaurs may have ended in springtime](#)," answer the second set of questions below. Your teacher may ask you to complete additional questions or the final prompt.

Understanding human bones

1. Name the two types of bone tissue. How do they differ?
2. What are bones made of? Name a few physical properties of bones based on their makeup?
3. What is the process by which human bones grow? Do they stop growing at some point?
4. Compare human bones with the bones of other animals. Name at least two differences.

Using bones as evidence

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