



FOLLOWING THE TRAIL OF EVIDENCE

INTRODUCTION

Dinosaurs roamed Earth for over 150 million years before they went extinct. Scientists have proposed a number of hypotheses to explain the mass extinction, which wiped out the dinosaurs along with about 70% of all species on Earth. These hypotheses included massive volcanic activity, competition by mammals, and a supernova explosion near Earth. The three-act film, *The Day the Mesozoic Died*, describes the evidence for what has now emerged as the leading theory for what actually killed the dinosaurs: the impact of a 10-km asteroid striking Earth.

PROCEDURE

1. Watch the HHMI short film *The Day the Mesozoic Died*. As you watch, pay attention to the key scientific evidence for or against the asteroid-impact hypothesis.
2. At the end of each act, your teacher will stop the film. You should pair up with another student (or a small group of students) and record the evidence and what the evidence means in the “Evidence of an Asteroid Impact” table at the end of this document. Each item should be no more than one or two lines in length. Also record the disciplines of the scientists mentioned in the film at the bottom of the table.

To illustrate what is expected, the table has already been filled in with some pieces of evidence and what they mean.

3. After the film, be prepared to share with the class some of the facts you and your partner discussed and which ones you think represent the most critical pieces of evidence. Other students might have listed facts that you and your partner did not think of; add them to your list if you think they are relevant to the asteroid hypothesis.
4. After completing the table, answer the questions at the end of this worksheet.



TABLE: EVIDENCE OF AN ASTEROID IMPACT

EVIDENCE PRESENTED	WHAT THE EVIDENCE SUGGESTS
<ul style="list-style-type: none"> • Forams were large and diverse in the Cretaceous period, but at the start of the Tertiary, most foram species went extinct. • The change in foram fossils occurred 65 million years ago, the same time as the dinosaurs disappeared. • The change in foram fossils was observed at two different locations more than 1,000 km apart. 	<ul style="list-style-type: none"> • There was a mass extinction of forams; this mass extinction happened at the same time as the dinosaur extinction. • With the forams gone, the base of the food chain was gone. • Extinctions documented in the fossil record line up exactly with the K-T boundary. • The foram extinction was widespread rather than a local event.



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Scientific disciplines mentioned in the film



QUESTIONS

1. What piece of evidence initially convinced Dr. Alvarez that a mass extinction had occurred at the K-T boundary?

2. What was the first clue that an asteroid had struck Earth at around the same time as the mass extinction?

3. What additional observations and findings supported the asteroid-impact hypothesis?

4. Which piece of evidence definitely showed that an asteroid had struck Earth? Explain your answer.

5. How does the asteroid-impact hypothesis explain the extinction of the dinosaurs and other species?

6. Provide two or more examples from the film that illustrate how scientists use multiple lines of evidence and a range of disciplines to draw conclusions.



TABLE: EVIDENCE OF AN ASTEROID IMPACT – GUIDED NOTES

EVIDENCE PRESENTED	WHAT THE EVIDENCE SUGGESTS
<p>Forams were large and diverse in the Cretaceous period, but at the start of the Tertiary period, most foram species went extinct.</p>	
<p>The change in foram fossils occurred 65 million years ago, the same time as the dinosaurs disappeared.</p>	
<p>The change in foram fossils was observed at two different locations more than 1,000 km apart.</p>	
<p>The K-T boundary at Gubbio had 30 times more iridium than is found in Earth’s crust; iridium was found at the K-T boundary all over the world.</p>	
<p>There was no plutonium-244 in the K-T layer.</p>	
<p>The K-T layer contains glasslike beads, called spherules, that form when vaporized rock cools and falls back down to Earth.</p>	
<p>The K-T layer also contains shocked quartz, which is rock shocked by an explosion or impact.</p>	
<p>The amount of iridium in the K-T boundary suggests that the asteroid was 10 km in diameter.</p>	
<p>The Cretaceous mud is very uniform up to the K-T boundary.</p>	



In Texas, scientists found boulders and other large rocks that came from different places.	
In Haiti, scientists found tektites, which are melted rock.	
There are abnormal gravitational fields near Chicxulub; this site is also full of shocked quartz.	
The rocks at this site are 65 million years old. The abnormal gravitational field matches a crater about 200 km in diameter.	
In the Hell Creek formation, scientists find dinosaur bones up to the K-T boundary but never after; the bones suggest that different species of dinosaurs lived there.	
The rocks where the crater is contain lots of sulfur.	
Fossil pollen from the Cretaceous represents many different species; about 60% of plant species disappeared at the K-T boundary.	
After the K-T boundary, scientists find mostly fern spores.	
After the K-T boundary, scientists find fossils of smaller animals that lived in holes	
SCIENTIFIC DISCIPLINES MENTIONED IN THE FILM	