

CRETACEOUS CRIME SCENE

Teacher Resource Guide

Program Overview

TOPIC: The scientific method used in palaeontology.

THEME: Palaeontologists use a multi-disciplinary approach, and look at various types of physical evidence to reconstruct events of the past. These reconstructions require logical interpretations of evidence and investigation, and can lead to a variety of different conclusions.

PROGRAM DESCRIPTION: Challenge your students' investigative skills in this prehistoric murder mystery. As they pursue leads like tooth marks and footprints, they will learn how scientists use evidence to reconstruct the ancient past.

AUDIENCE: Grades 6 - 11

Curriculum Connections

Grade 6 Science: Climate Change; Ecosystems, Scientific Explanations

Grade 7 Science: Interactions and Ecosystems, Planet Earth

Grade 8 Science: Freshwater and Saltwater Systems

Grade 9 Science: Biological Diversity

Grade 11 Biology 20: Ecosystems and Population Changes

Science 20: Changes in Living Systems

Program Objectives

Students will be able to:

1. Interpret the position and variety of fossils to help them describe events of the past.
2. Use rocks and fossils to identify ancient environments.

3. Differentiate between footprints from carnivorous and herbivorous dinosaurs.
4. Match the weapons and motives of ancient organisms to physical evidence of an ancient "crime."

Suggested Pre-Visit Activity

1. PROGRAM TERMINOLOGY

Following are some terms to introduce to your class before you attend the Cretaceous Crime Scene program at the Royal Tyrrell Museum. These terms will assist the students with the information presented in the program.

Cretaceous Period: the last period of the Mesozoic Era, approximately 145-66 million years ago. The Cretaceous Period ended with one of the largest mass extinctions in Earth history, the K-T (KPg) extinction, when many species, including the dinosaurs, pterosaurs, and large marine reptiles, disappeared.

Forensic Science: scientific analysis of physical evidence.

Geological Time Scale: provides a system of chronological measurement to assist scientists in describing the timing and relationships between events that have occurred during the history of the Earth.

Mesozoic Era: is the era from about 252 million years ago to 66 million years ago. It is divided into three periods - Triassic, Jurassic, and Cretaceous. It is often referred to as the "Age of Reptiles" after the dominant fauna of the era.

Palaeoenvironment: an ancient or past environment.

Palaeontologist: is a scientist who studies ancient life through the fossil record.

Palaeontology: the study of ancient life as recorded by fossil remains.

2. LEAD DISCUSSIONS/RESEARCH INTO TOPICS SUCH AS:

1. What happens in modern day crime scene investigations?
2. What creatures, other than dinosaurs, lived during the Mesozoic Era (Age of Dinosaurs)?
3. Research into traces left behind by creatures, other than physical remains (eg. trackways, burrows, etc.).

4. How long were groups of organisms on Earth? Have the class research time scales represented by creatures. Each student could choose a species or group from each period and determine the length of time they existed. This could work well plotted on a graph/chart as a histogram, showing overlaps, extinctions and mass extinctions. With enough research, this graph or chart can give the class an idea on how the time scale was constructed in the first place.
5. To further the research into establishing time scales, research into radiometric dating. These dates can be used to fix the appearance and disappearance of the species/groups, such as trilobites, ammonites, Dunkleosteus, Dimetrodon, Brachiosaurus etc. Note: one point here is that not all creatures lived at the same time.
6. Palaeoenvironment: Pick a fossil creature and research into the palaeoenvironment(s) at that time in Alberta or other locality where this creature is found. For example, what type of palaeoenvironment was T. rex thought to live in? What evidence is used to identify the palaeoenvironment?

Post-Program Activity

1. MORE CRIMES

Research some other possible “crime scene” scenarios or mysteries from the Cretaceous Period. What clues would you look for to satisfy these scenarios?

Suggestions:

- A) Holes in ammonite shells: Were they limpet marks or mosasaur bite marks? What are they caused by?

<http://geology.geoscienceworld.org/cgi/content/abstract/26/10/947?ck=nck>

http://evolution.berkeley.edu/evolibrary/article/0_0/lines_02

Keywords: holes in ammonite shell, bite marks ammonite

B) Carnivorous dinosaurs – solitary or pack hunters?
What is the evidence for or against?

<http://news.bbc.co.uk/2/hi/science/nature/1036004.stm>

<http://www.abc.net.au/science/news/stories/s1618886.htm>

<http://dinosaurs.about.com/od/typesofdinosaur/a/raptors.htm>

<http://www.dailymail.co.uk/sciencetech/article-1388574/Tyrannosaurus-rex-hunted-bloodthirsty-packs-researchers-claim.html>

Keywords: pack hunting dinosaurs, how dinosaurs hunted

C) Investigate dinosaur bonebeds in the world. What do they tell us?

http://blog.everythingdinosaur.co.uk/blog/_archives/2007/11/29/3381467.html

<http://www.icr.org/article/5521/>

Keywords: dinosaur bonebeds, bonebeds

D) Would bonebeds form today?

<http://news.nationalgeographic.com/news/2007/10/photogalleries/wildebeest-pictures/index.html>

Keywords: bonebeds forming today

E) Horned dinosaurs (ceratopsians) – What were the frills used for?

<http://en.wikipedia.org/wiki/Ceratopsidae>

<http://dinosaurs.about.com/od/typesofdinosaur/a/ceratopsians.htm>

<http://www.ucmp.berkeley.edu/diapsids/ornithischia/ceratopsia.html>

<http://scienceblogs.com/tetrapodzoology/2009/04/23/alternative-ceratopsians/>

Keywords: ceratopsians, horned dinosaurs, purpose of dinosaur frill

F) Duck-billed dinosaurs (hadrosaurs) – What were the crests used for?

<http://palaeoblog.blogspot.ca/2008/10/crest-function-in-hadrosaurs.html>

<http://www.ucmp.berkeley.edu/diapsids/ornithischia/hadrosauria.html>

Keywords: Duck-bill dinosaurs, Hadrosaurs, Hadrosaur crest function

Links to Other Websites

Links to websites are provided solely for your convenience. The Royal Tyrrell Museum does not endorse, authorize, approve, certify, maintain, or control these external Internet addresses and does not guarantee the accuracy, completeness, efficacy or timeliness of the sites listed.

2. KEY TERMS

Following are some terms to introduce to your class before you attend the Cretaceous Crime Scene program at the Royal Tyrrell Museum. These terms will assist the students with the information presented in the program.

Palaeopathology: the study of diseases of ancient man and fossil animals.

Taphonomy: the study of the processes: burial, decay, and preservation, that affects animal and plant remains as they become fossilized.