

CRETACEOUS CRIME SCENE

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: Evidence and Investigation
- 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 Change
Science 20: Changes in Living Systems

PROGRAM OBJECTIVES:

1. Students will interpret fossil types and positions in order to understand past events.
2. Students will use rocks and fossils to identify ancient environments.
3. Students will differentiate between carnivorous and herbivorous dinosaur footprints.
4. Students will analyze evidence from an ancient "crime scene," and use it to match weapons and motives to ancient organisms.

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SUGGESTED PRE-VISIT ACTIVITIES

I. PROGRAM TERMINOLOGY

Introduce these terms to your class prior to your program at the Royal Tyrrell Museum to ensure your students are comfortable with the information presented in the program.

Cretaceous Period: The last period of the Mesozoic Era (approximately 145–65 million years ago). The Cretaceous Period ended with one of the largest mass extinctions in Earth’s history, the K-T extinction, when many species (including dinosaurs, pterosaurs, and large marine reptiles) disappeared.

Forensic Science: Scientific analysis of physical evidence.

Geologic Time Scale: 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: The era from about 250 million years ago to 65 million years ago. It is divided into three periods—Triassic, Jurassic and Cretaceous. It is often referred to as the “Age of Reptiles” or “Age of Dinosaurs” after its dominant fauna.

Palaeoenvironment: An ancient or past environment.

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

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

II. 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. What “trace elements” were left behind by creatures, other than physical remains (e.g. trackways, burrows, etc.).
4. How long were different groups of organisms on Earth? Have students choose a species or group from each geological time period and determine the length of time they existed. Plot results on a graph or chart (like a histogram) so that overlaps, extinctions, and mass extinctions are evident. With enough research, this data will give the class an idea about how the geological time scale was developed.
5. To further the understanding of geological time, do some research into radiometric dating. See if these dates can be used to clearly determine when certain species or groups (like trilobites, ammonites, *Dunkleosteus*, *Dimetrodon*, *Brachiosaurus* etc.) appeared or disappeared. This exercise will help students understand that not all creatures lived at the same time.
6. Pick a creature that lived in Alberta and do some research into its palaeoenvironment. For example, what type of palaeoenvironment did *Albertosaurus* live in? How do we know?

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POST-VISIT ACTIVITIES

I. MORE CRIMES

Below are some other mysteries from the Cretaceous Period. What clues would help you solve these puzzles or better understand these scenarios?

1. Round indentations in ammonite shells: Were they caused by limpets or are they mosasaur bite marks?

www.geology.geoscienceworld.org/cgi/content/abstract/26/10/947?ck=nck

www.bhigr.com/store/product.php?productid=132

www.evolution.berkeley.edu/evolibrary/article/_0_0/lines_02

2. Carnivorous dinosaurs: did they hunt alone or in packs? What is the evidence for or against?

www.news.bbc.co.uk/2/hi/science/nature/1036004.stm

www.abc.net.au/science/news/stories/s1618886.htm

www.animal.discovery.com/news/briefs/20060417/meatdino.html

www.dinosaurs.about.com/od/typesofdinosaurs/a/raptors.htm

3. Dinosaur bonebeds: What are they? What do they tell us? Might bonebeds form today?

www.thedailystar.net/newDesign/news-details.php?nid=144544

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

www.news.nationalgeographic.com/news/2007/10/photogalleries/wildebeest-pictures/index.html

4. Horned dinosaurs (ceratopsians): What did their frills look like? What were they used for?

www.dinosaurs.about.com/od/typesofdinosaurs/a/ceratopsians.htm

www.amnh.org/exhibitions/dinosaurs/display/horned.php

5. Duck-billed dinosaurs (hadrosaurs): What were their crests used for?

www.fossilnews.com/1996/social.html

www.sciencera.com/earth-sciences/paleontology/hadrosaurs-duckbills-and-crested-dinosaurs/

II. WHAT THE FOSSILS SAY

The Royal Tyrrell Museum produces a publication called "Resource-A-Saurus Rex" which is available for purchase on-line. If you have a copy of this teacher's guide, complete the activity called "Palaeoenvironments" on pages 63-66.

www.tyrrellmuseumshop.com/shop/shoppingcart/products.php.