

RAPTORS IN ACTION

Teacher Resource Guide

Program Overview

TOPIC: Dromaeosaurid dinosaurs, commonly known as “raptors.”

THEME: We can learn about the adaptations of “raptor” dinosaurs by studying their fossils, looking at modern animals, and building mechanical models.

PROGRAM DESCRIPTION: Examine real fossils, hold a replica dinosaur brain, and assemble a life-sized “raptor” skeleton. Students will learn about adaptations and simple machines through a series of fun activities, culminating with working in groups to build a mechanical “raptor” leg, which they will bring to life in a dinosaur-inspired relay race.

AUDIENCE: Grades 3 - 6

Curriculum Connections

Grade 3: **Science:** Building with a Variety of Materials
Science: Animal Life Cycles

Grade 4: **Science:** Wheels & Levers
Science: Building Devices and Vehicles that Move

Grade 6: **Science:** Evidence and Investigation
Science: Air & Aerodynamics

Program Objectives

Students will:

1. Understand some of the adaptations that contributed to the success of dromaeosaurid dinosaurs, or “raptors,” such as sickle claws, feathers, sharp teeth, and large brains.
2. Make connections between vertebrate movement and simple machines.
3. Understand that popular culture portrayals of dinosaurs are not always accurate.
4. Discover the connections between dromaeosaurid dinosaurs (“raptors”) and birds.

Vocabulary

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.

Adaptation: A special feature animals use to survive. Animals have different adaptations depending on where they live and what they eat. Some adaptations can be seen on an animal's body (example: sharp teeth and claws).

Camouflage: An adaptation that helps an animal hide. Often animals are camouflaged by having a colour or pattern that blends in with their surroundings, making them hard to see.

Behaviour: How an animal acts (example: do they hunt in packs or by themselves?). We do not always know how animals behaved in the past, but we can look at animals alive today to get ideas about how they might have behaved. Some behaviours can be learned or changed, while other behaviours are instinctual and cannot be easily changed.

Display: Something that helps an animal talk or communicate with other animals. It could be a part of their body (example: a peafowl's big tail feathers are for display) or a behaviour (example: that same peafowl screaming loudly).

Instinct: Any behaviour that an animal displays without having to learn.

Insulation: Anything that helps to retain heat. Your coat is good insulation for you in winter. Animals have insulation like fur, feathers, or fat to keep themselves and/or their eggs and babies warm.

Family Tree: Shows the relationships between different members of a family. Some family trees show the relationships between close family members like children, parents, and grandparents. Scientists use bigger family trees to show relationships between different groups of animals.

Fossil: The preserved remains or traces of ancient life.

Learning: The ability to do something new or change a behaviour. Humans are very good at this.

Lever: A type of simple machine consisting of a bar that pivots on a fixed point or fulcrum.

Palaeontologist: A scientist who studies the preserved remains and traces of ancient life through the fossil record.

Pulley: A type of simple machine that uses rope, as well as a wheel and axis, and can make it easier to move objects by redirecting force.

Simple Machine: Mechanical devices with no or very few moving parts that change the direction or magnitude of force. These are the building blocks of more complex machines. The six simple machines are: lever, wheel and axis, pulley, inclined plane, wedge, and screw.

Wedge: A type of simple machine that concentrates force on a point.

Dinosaurs You May Meet in This Program

This section does not need to be reviewed with the students before the program, but is provided as a reference if the teacher wishes to refer to, or do more research on any of these species, later on. The number and variety of dinosaur species met in each program will vary based on grade level and interest.

Avian dinosaurs: Also known as birds. A group of small feathered dinosaurs with hollow bones and toothless beaks. These are the only dinosaurs still alive today.

Dromaeosaurid dinosaurs: A group of small, feathered dinosaurs with hollow bones and retractable sickle claws. Sometimes called “raptor dinosaurs.” They are closely related to avian dinosaurs, or birds.

Dromaeosaurus albertensis: A type of dromaeosaurid that lived in Alberta. It is believed to have had feathers, but probably could not fly or glide. Not counting its long tail, this dinosaur was about the size of a large dog such as a Labrador retriever or German shepherd.

Microraptor zhaoianus: A type of dromaeosaurid that lived in Asia. Fossils show that it had feathers on its entire body, including long feathers on its arms and legs that formed four wings. These feathers may have had an iridescent colouring, like a hummingbird or a crow. Microraptor may have been able to fly. It was about the size of a chicken.

Sinornithosaurus millenii: A type of dromaeosaurid that lived in Asia. Fossils show that its body was fully covered in feathers. These feathers may have been reddish-brown, yellow, black, and grey. Sinornithosaurus may have been able to glide. It was about the size of a chicken.

Troodontid dinosaurs: A group of small, feathered dinosaurs with exceptionally large brains and eyes. They are closely related to both birds and dromaeosaurid dinosaurs.

Utahraptor ostrommaysi: A type of dromaeosaurid that lived in North America. It is believed to have had feathers, but it could not fly or glide. It was about the size of a horse, making it one of the largest dromaeosaurid dinosaurs.

Velociraptor mongoleinsis: A type of dromaeosaurid that lived in Asia. It had feathers, but probably could not fly or glide. Not counting its long tail, it was about the size of a coyote.

Activities

These supplementary questions and activities may be used before, or after, visiting the Museum.

1. SIMPLE MACHINES

- a. Print and use the template provided at the end of this guide to create a "raptor" puppet. It is recommended to glue the template onto cardboard or cardstock before cutting it out. Connect pieces together using brass tack fasteners at "A" and "B".
- b. Point "A" is the fulcrum of the lever. Point "B" represents the muscles that move a dinosaur's jaw. Use the handle to move the jaw while you hold the skull still!
- d. Which parts of your own body can be compared to simple machines? Try different movements (clench/unclench fists, wave arms, etc.) and think about how your muscles and bones move.

2. ADAPTATIONS

- a. Pick a living animal.
- b. How does your animal behave? (Examples: What do they eat? Where do they live? Do they live with their family or by themselves? Do they come out in the day or at night?)
- c. What adaptations does your animal have on their body? Make a list or draw a picture pointing out your animal's adaptations.

For older grades:

- d. Without changing the adaptations that are part of its body, do you think your animal could change its behaviour to survive if it had to live in a new place or eat a different kind of food? Why or why not?

3. FEATHERS AND FLIGHT

- a. Dromaeosaurid dinosaurs had feathers. Do you think that they could fly? Why or why not?
- b. Can all birds fly? Why or why not?
- c. Print and decorate the dromaeosaurid colouring page provided at the end of this guide. What kind of feathers does your dromaeosaurid have? What colour are they? Are these feathers good for camouflage, display, insulation, flight, or all four? Why?

3. MEDIA AWARENESS

- a. Sometimes movies about dinosaurs do not get everything correct. Why do you think this is?
- b. What are some different sources for learning about dinosaurs?
- c. How can you check if a source is accurate or not?
- d. Why is it important to know how old a source is?

Additional Resources

1. FLIGHTLESS BIRD LIST

- Auckland teal
- Campbell teal
- Cassowaries
- Cuban giant owl (extinct)
- Dodo (extinct)
- Domesticated breeds of turkey, chicken, and duck
- Elephant bird (extinct)
- Emu
- Henderson crake
- Flightless cormorant
- Flightless rails
- Flightless steamer ducks
- Giant coot
- Guam crake
- Gough moorhen
- Junin grebe
- Kakapo
- Kiwis
- Lyall's wren (extinct)
- Lord Howe woodhen
- Makira moorhen
- Moa (extinct)
- Ostrich
- Penguins
- Rhea
- Samoan moorhen
- Takahe
- Tasmanian native-hen
- Terror birds (extinct)
- Titicaca grebe
- Weka

2. MUSEUM SPEAKER SERIES ON YOUTUBE

Insights from China on the Dinosaurian Origin of Birds:

<https://youtu.be/AqLPACPAcmw>

Archaeopteryx: The World's Most Famous Bird:

<https://youtu.be/yCd3TuSK6tU>

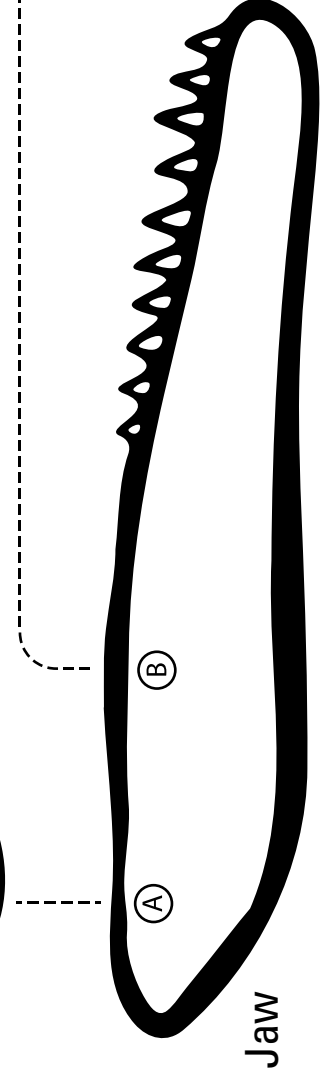
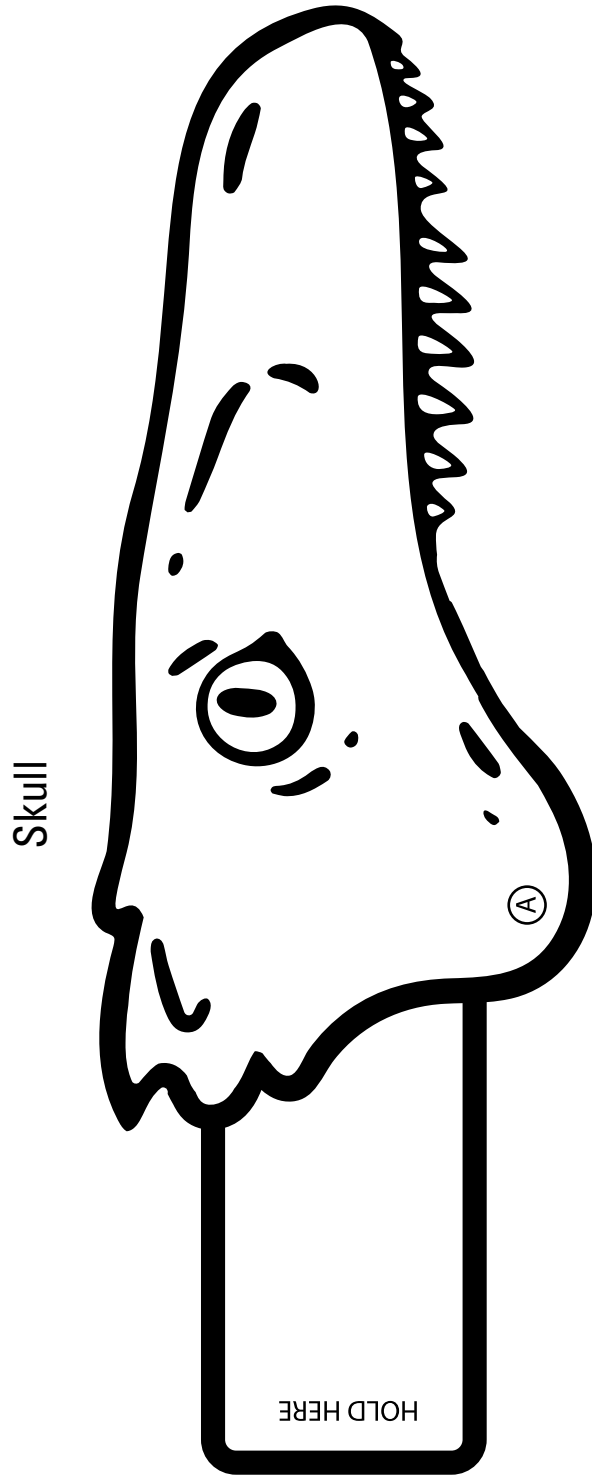
How Did Birds Get Their Wings? Feathered Ornithomimids from Alberta and the Origin of Wings:

<https://youtu.be/YOOmdA6w-Vs>

Note: Links were last accessed March 2022.

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.

“Raptor” Jaw Activity



Dromaeosaurid Colouring Page

