

## GRADES 9-12 ACTIVITIES

Welcome to *Extreme Mammals: The Biggest, Smallest, and Most Amazing Mammals of All Time*. Use this sheet to help your class investigate mammals' evolutionary relationships and the role that environment plays in adaptation and distribution. The activities below and on the Student Worksheet can be adapted to meet your students' interests and abilities.

**BEFORE YOUR VISIT**

**Online Activity:** Have students read this essay about cladistics ([amnh.org/exhibitions/permanent/fossilhalls/cladistics](http://amnh.org/exhibitions/permanent/fossilhalls/cladistics)). Ask them how the cladistic method helps us understand how all organisms are related. Ask students to explain the different parts of a cladogram (evolutionary tree), including nodes and branches.

**Activity:** Download the "Making Cladograms" PDF ([amnh.org/education/resources/rfl/pdf/hob\\_cladograms.pdf](http://amnh.org/education/resources/rfl/pdf/hob_cladograms.pdf)) and distribute it along with the required materials. Students will use coins to explore the concept of grouping organisms based on shared characteristics.

**New York State Science Core Curriculum Living Environment**

Performance Indicator 3.1

Explain the mechanisms and patterns of evolution;

Major Understandings 3.1g and 3.1h

**DURING YOUR VISIT****IN THE EXTREME MAMMALS EXHIBITION**

Use the activities and guiding questions in Sections 1 and 2 of **Teaching in the Exhibition** in the Guide to help students develop their understanding of how scientists classify and define mammals. Refer to Section 10 for strategies to help your students explore the **Extreme Extinction** section.

Students can use the reproducible on the reverse side of this sheet to further explore these concepts. Provide your students with a copy of the **Map of the Exhibition** to help them find locations in *Extreme Mammals*.

**IN THE WALLACE WING OF MAMMALS AND THEIR EXTINCT RELATIVES (Fourth Floor)**

As a class, watch the large screen video in the **Orientation Center** on the fourth floor. Ask students:

- Why are there so many species on Earth?
- How does a cladogram represent evolutionary history?

Proceed to the Lila Acheson Wallace Wing of Mammals and their Extinct Relatives. Ask students to select a group of animals in any alcove. Have them compare and contrast the feet of two different animals and then consider how particular types of feet may have helped them survive. Ask them to apply this process of observation and inference to a second feature (such as teeth, headgear, or general body shape).

**BACK IN THE CLASSROOM**

**Class Discussion:** Have students refer to the cladogram on the Student Worksheet. Ask students to explain why *Ambulocetus* is classified as a member of the hooved animal group Artiodactyla, even though it doesn't have hooves. What does this tell them about the way scientists classify animals?

**Class Discussion:** Based on their exploration of the **Extreme Extinction** section of the exhibition, prompt students to think of ways that major climate change has affected the diversity of mammals. How is one mammal, *Homo sapiens*, contributing to current extinctions?

An answer key for the activities and Student Worksheet is available at [amnh.org/education/extrememammals](http://amnh.org/education/extrememammals).

# STUDENT WORKSHEET GRADES 9-12

Scientists observe mammals in their environments, and analyze modern and fossil specimens back in the lab. Today, use the *Extreme Mammals* exhibition as your laboratory: examine specimens, listen to scientists and learn about their work, collect data, and ask questions!

## The Quest to Learn More About Life on Earth

Draw on information from the exhibition, as well as your prior knowledge, to complete this chart. Review each mammal, and place an "X" to indicate which features it possesses. When the chart is complete, answer these questions on the back of this sheet:

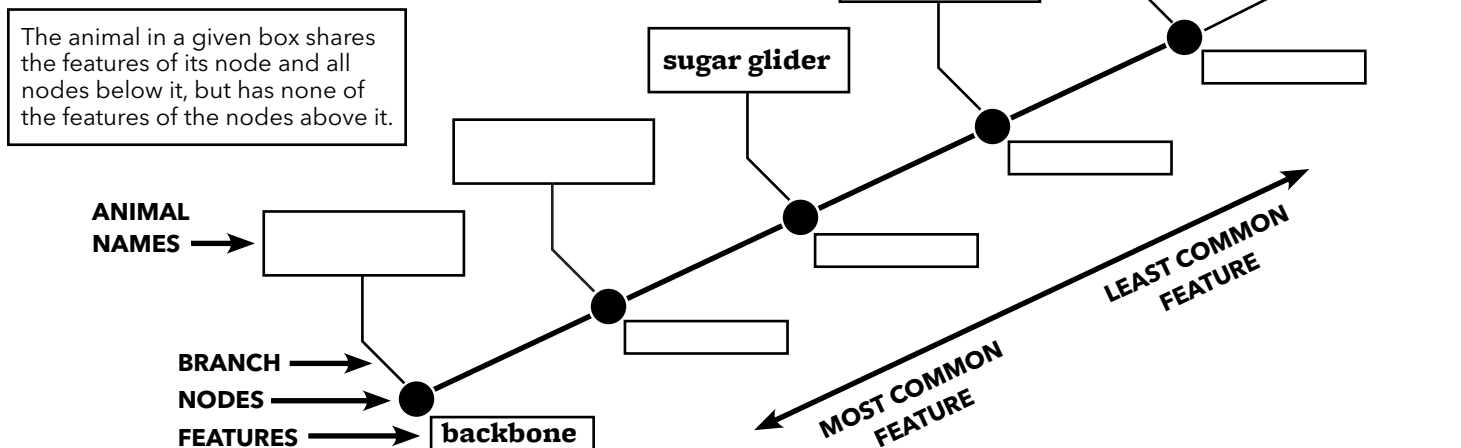
- Which feature appears most frequently?
- Which feature appears least frequently?
- What does this suggest about relationships between mammals?

FEATURES	Platypus	Human	Cow	Sugar Glider	Frog	Ambulocetus
Hooves			X			X
Live Birth			X			
Placenta			X			
Backbone			X			
Milk Glands			X			

While *Ambulocetus* may not appear to have hooves, its flippers evolved from feet with hooves!

## Make Your Own Cladogram

Using the data from your feature chart, complete the cladogram. Two boxes have been filled in as an example. (Note: You may want to do this back in the classroom.)



## Our Changing Environment

As environments change over time, so do the mammals that inhabit them. In the **Extreme Climates** section of the exhibition, observe the diorama that depicts Ellesmere Island 50 million years ago. Choose one mammal, list three of its physical characteristics, and write how these features helped it survive.

**MAMMAL:** \_\_\_\_\_

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Now use the viewers at the sides of the diorama to take a look at what the environment of Ellesmere Island is like today. List three characteristics that would help a mammal survive in this environment.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_