GRADES 6-8 ACTIVITIES

Welcome to *Extreme Mammals: The Biggest, Smallest, and Most Amazing Mammals of All Time*. Use this sheet to help your students explore how mammals evolved and how incredibly diverse they are. The activities below and on the Student Worksheet can be adapted to meet your students' interests and abilities.

BEFORE YOUR VISIT

Class Discussion: Share the **Useful Concepts: Natural Selection and Adaptation** section of the Guide with your students. Discuss how evolution has modified mammalian bodies over time. What helped some species survive and caused others to die out?

Online Activities:
Dive deeper into these concepts by having your students watch the video *What Killed the Mammoths? Could It Have Been a Killer Plague?* (**amnh.org/education/resources/whatkilledmammoths**). Or have them play the *Layers of Time* game (**amnh.org/ology/layers_of_time**) to understand how the fossil record was formed.

New York State Science Core Curriculum
Major Understanding LE 3.2b
Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are common. Fossils are evidence that a great variety of species existed in the past.

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 this Guide to guide your students' exploration of mammal evolution, as well as the strategies in Section 9 to support your students' investigation of isolation and adaptation.

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: HALL OF PRIMITIVE MAMMALS* (Fourth Floor)

Take a walk back in time! Find the **ground sloth**, **armadillo**, and **glyptodont** fossils. Have students sketch each of these mammal fossils and answer the following questions: When did the mammal live? What are its extreme features? Ask students to read the information on the displays to find out what else scientists know about these mammals. Have them describe one feature of each mammal, the purpose it served, and the evidence that supports their answer. A worksheet for this activity is available at **amnh.org/education/extrememammals**.

Before you leave, stop at the three giant murals painted by Charles R. Knight in 1911. Knight depicted these ancient animals and environments based on careful study of the fossil record. Point out that artists and scientists both rely on careful study of the fossil record in order to depict and understand the history of life on Earth. Back in the classroom or at home, have the students re-examine their three drawings and consider how they would "flesh out" these animals on the basis of fossil evidence alone.

BACK IN THE CLASSROOM

Research Activity: Direct students to the video *Lemurs of Madagascar: Surviving on an Island of Change* (**amnh.org/sciencebulletins/lemurs**). Ask students to recall the **Extreme Isolation** section of the exhibition, which explained how geographic isolation can lead to the evolution of extreme traits. Ask students why it's important for scientists to study how animals adapt to changing environments.

An answer key for the activities and Student Worksheet is available at **amnh.org/education/extrememammals**.

STUDENT WORKSHEET GRADES 6-8

Go on an Expedition

As you go through the exhibition, imagine you're a scientist in the field looking for a mammal with "extreme" and "normal" characteristics. Choose one mammal. Write down its scientific name and common name (if available), and label its "extreme" and "normal" traits.

SCIENTIFIC NAME: _____ **COMMON NAME:** _____

EXTREME TRAITS: _____

NORMAL TRAITS: _____

Head to Tail

With a partner, visit the **Heads, Hair & Armor**, and **Mammals in Motion** sections of the exhibition. Observe similarities and differences in head gear, hair and armor, and locomotion (the way animals move). Together, answer the following questions:

Heads: What are some of the functions of headgear? _____

Hair & Armor: How do different body coverings benefit these animals in their environments? _____

_____

Locomotion: Many groups of mammals evolved to live in water. How do their bodies differ from mammals that live on land? _____

Check out the computer interactive in **Section 7: Mammals in Motion** to compare the different ways that mammals move on land, in the water, or through the air.

Spectacular Adaptations

Go to the **Extreme Climates** diorama in Section 8 to explore the conditions on Canada's Ellesmere Island 50 million years ago. Using the information on the display and your observations, write a short description predicting how this environment might change over time, and how this could affect the mammal groups that live there.

_____

_____

Look through the viewers at the sides of the diorama to see Ellesmere Island as it is today. How has the environment actually changed? On the back of this sheet, write a detailed description using this new information.

What Happens in Isolation? (Answer the questions below on the back of this sheet.)

View the **Scientist at Work video** in the **Extreme Isolation** section, which explains the role of geographic isolation in evolution. What kinds of extreme features have evolved in places that were once isolated? Why is isolation so important in the evolution of "extreme" traits?

Observe one South American mammal in the **Extreme Isolation** section and read the information that describes it. What does the fossil evidence tell us about this extinct mammal?

GRADES 6-8 ACTIVITIES

ANSWER KEY

Welcome to *Extreme Mammals: The Biggest, Smallest, and Most Amazing Mammals of All Time*. Use this sheet to help your students explore how mammals evolved and how incredibly diverse they are. The activities below and on the Student Worksheet can be adapted to meet your students' interests and abilities.

BEFORE YOUR VISIT

Class Discussion: Share the **Useful Concepts: Natural Selection and Adaptation** section of the Guide with your students. Discuss how evolution has modified mammalian bodies over time. *Mammals show a great deal of diversity. Evolution has modified mammalian bodies in many ways, producing a wide range of shapes, sizes, and body characteristics. For example, marine mammals may have flippers and torpedo-shaped bodies that help them swim. Review the Essential Questions in the Educator Guide to guide this discussion.*

What helped some species survive and caused others to die out?

As environments change over time, living things must adapt or go extinct. Different traits are favored in different habitats, and are passed on to future generations. Many mass-extinctions from the past appear to have been caused by severe climate change. Recent extinctions are caused by human activities, such as habitat destruction, pollution, and the introduction of invasive species. The species most likely to go extinct include the largest organisms, with low reproductive rates, and species with very limited distributions.

New York State Science Core Curriculum
Major Understanding LE 3.2b
Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are common. Fossils are evidence that a great variety of species existed in the past.

Online Activities:
Dive deeper into these concepts by having your students watch the video *What Killed the Mammoths? Could It Have Been a Killer Plague?* (**amnh.org/education/resources/whatkilledmammoths**). Or have them play the *Layers of Time* game (**amnh.org/ology/layers_of_time**) to understand how the fossil record was formed.

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 this Guide to guide your students' exploration of mammal evolution, as well as the strategies in Section 9 to support your students' investigation of isolation and adaptation.

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*.

GRADES 6-8 ACTIVITIES cont'd

ANSWER KEY

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

Take a walk back in time! Find the **ground sloth**, **armadillo**, and **glyptodont** fossils. Have students sketch each of these mammal fossils and answer the following questions: When did the mammal live? What are its extreme features? Ask students to read the information on the displays to find out what else scientists know about these mammals. Have them describe one feature of each mammal, the purpose it served, and the evidence that supports their answer. A worksheet for this activity is available at **amnh.org/education/extrememammals**.

Before you leave, stop at the three giant murals painted by Charles R. Knight in 1911. Knight depicted these ancient animals and environments based on careful study of the fossil record. Point out that artists and scientists both rely on careful study of the fossil record in order to depict and understand the history of life on Earth. Back in the classroom or at home, have the students re-examine their three drawings and consider how they would "flesh out" these animals on the basis of fossil evidence alone.

BACK IN THE CLASSROOM

Research Activity: Direct students to the video *Lemurs of Madagascar: Surviving on an Island of Change* (**amnh.org/sciencebulletins/lemurs**). Ask students to recall the **Extreme Isolation** section of the exhibition, which explained how geographic isolation can lead to the evolution of extreme traits. Ask students why it's important for scientists to study how animals adapt to changing environments. *It can give them information about how organisms might react to man-made (anthropogenic) changes in the future. Careful study can also help create conservation strategies to help protect species.*

An answer key for the activities and Student Worksheet is available at **amnh.org/education/extrememammals**.

STUDENT WORKSHEET GRADES 6-8

ANSWER KEY

Go on an Expedition

As you go through the exhibition, imagine you're a scientist in the field looking for a mammal with "extreme" and "normal" characteristics. Choose one mammal. Write down its scientific name and common name (if available), and label its "extreme" and "normal" traits.

EXAMPLE OF STUDENT WORK:

SCIENTIFIC NAME: *giraffe camelopardalis* **COMMON NAME:** *giraffe*

EXTREME TRAITS: *Very tall, elongated neck, extreme circulatory system*

NORMAL TRAITS: *4 limbs, 2 eyes, fur, provides milk to young*

Head to Tail

With a partner, visit the **Heads, Hair & Armor**, and **Mammals in Motion** sections of the exhibition. Observe similarities and differences in head gear, hair and armor, and locomotion (the way animals move). Together, answer the following questions:

Heads: What are some of the functions of headgear? *Defense, digging for food/shelter, sexual selection.*

Hair & Armor: How do different body coverings benefit these animals in their environments? *Warmth, defense, camouflage.*

Locomotion: Many groups of mammals evolved to live in water. How do their bodies differ from mammals that live on land? *(Extreme features among aquatic mammals) Blubber/insulation, fins/flippers, flap over nose (often at top of head), collapsible lungs.*

Check out the computer interactive in **Section 7: Mammals in Motion** to compare the different ways that mammals move on land, in the water, or through the air.

Spectacular Adaptations

Go to the **Extreme Climates** diorama in Section 8 to explore the conditions on Canada's Ellesmere Island 50 million years ago. Using the information on the display and your observations, write a short description predicting how this environment might change over time, and how this could affect the mammal groups that live there. *Answers will vary.*

Look through the viewers at the sides of the diorama to see Ellesmere Island as it is today. How has the environment actually changed? *The environment has changed from tropical swamps to frozen tundra.* On the back of this sheet, write a detailed description using this new information.

Description should these key concepts:

- *Different mammals are living there today:*
  - *Herbivores: Musk Ox, Caribou, Rabbits, Lemmings*
  - *Carnivores: Polar Bears, Wolves, Wolverines, Foxes.*
- *The colder climate drastically altered the ecosystem.*
- *The physical environment changed: water supply, shelter, weather, etc.*
- *Plant life changed and there is less food available for herbivores.*
- *Thick hair/fur is needed to survive this colder environment.*

STUDENT WORKSHEET GRADES 6-8

ANSWER KEY

What Happens in Isolation?

(Answer the questions below on the back of this sheet.)

View the **Scientist at Work video** in the **Extreme Isolation** section, which explains the role of geographic isolation in evolution. What kinds of extreme features have evolved in places that were once isolated?
Examples of South American extreme features include large and small body size and headgear. Many closely related species had very different body sizes living in the same environment – the equivalent of having tiny horses live in the same location as very large horses.

Why is isolation so important in the evolution of "extreme" traits? *Isolation can cause groups of similar species to evolve specialized and extreme traits and become more distinct from each other.*

Observe one South American mammal in the **Extreme Isolation** section and read the information that describes it. What does the fossil evidence tell us about this extinct mammal?
Students should be able to determine some of the following about their chosen mammal:

- *Diet (herbivore, carnivore, omnivore, browser, grazer, scavenger, predator)*
- *Locomotion (biped, quadruped, swimming, climbing, burrowing, etc.)*
- *Other Behaviors (reproduction, display, male competition, finding shelter, etc.)*

Students should be prepared to list normal and extreme features.