

ACTIVITY: Compare Horse Hoof & Tooth Fossils

Grade Level: K-5

Introduction

In this activity, students will explore their own toes and teeth to learn about the functions of these body structures. They'll then interpret the functions of fossil horse foot bones and teeth that have adapted for different habitats.

Objectives

Students will:

- perform brief explorations of their own toes and teeth
- identify functions of toes and teeth
- compare and contrast the shape of horse feet and teeth fossils over time
- connect the structure and functions of horse feet and teeth fossils to different habitats in which the horses lived

Time Frame

- One class period

Materials

- Four Horse Feet worksheet, duplicated for each student
- Four Horse Teeth worksheet, duplicated for each student

Procedure

Prior Knowledge

1. Use a class discussion (or your visit to *The Horse* exhibition) to familiarize students with two primary habitats horses have adapted to live in over evolutionary time: forests and grasslands. A summary follows. For more information, go to: <http://www.amnh.org/exhibitions/horse/?section=evolution>
2. Tell students that by examining the feet of extinct animals, paleontologists can tell much about the ground they walked on. By examining the teeth of extinct animals, paleontologists can tell much about what they ate. Ask students to describe where they have heard the term horsepower used. (When describing engines such as those in a vehicle, lawnmower, chainsaw, or vacuum cleaner.)

Foot Bones Exploration

3. Have students remove one shoe and stand on one foot (either in their sock or barefoot). Have them then lift their toes of their standing foot off the ground so that they're only using the foot muscles to balance, with no help from the toes. Ask: In which state is it harder to balance? Have them close their eyes and repeat the exercise "with and without toes," trying to stay up. Have students complete the calculations on the Solving Horsepower worksheet.

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Foot Bones Exploration (continued)

4. Ask: How did your toes help you balance? (Students may say that their toes gripped the ground to steady their body, and that spreading out the toes made standing on one foot easier.) Why are toes useful? (They help you keep your balance.) Why else are they useful? (They help you push off the ground to take a step, they can manipulate objects, etc.)
5. Now have students imagine that the classroom floor was made of soft mud. To be able to walk quickly and easily through the mud, would they choose to walk barefoot with your toes spread out or walk on tiptoes in ballet slippers? Why? Guide students to the conclusion that they'd sink deeper if they stood on tiptoe because the weight of their body would "drill" into the ground. Ask: On what type of ground would it be easier to walk on tiptoe ballet slippers? (On harder ground.)
6. Distribute Four Horse Feet to students.
7. Direct students to the picture of the Eohippus foot bones—a very ancient horse. Call on a volunteer to point out the hooves. Ask: Why are hooves useful? (Their hard surfaces would protect the toes while walking.) Call on another volunteer to describe the other features of the Eohippus bones. Lead students to conclude that its all four toes are on the ground when it walked, similar to your toes when barefoot.
8. Direct students to the picture of the Equus foot bones—the modern horse. Have another volunteer describe the features of the Equus bones. Lead students to the conclusion that Equus walks "on its toes" like the ballet slippers.
9. Have students answer the questions on Four Horse Feet.

Teeth Exploration

10. Have students use their tongues to feel their front and back teeth. Ask: How are the front and back teeth different? What are they used for? Help students conclude that the front teeth (incisors and canines) are narrow and sharp for tearing and biting and the back teeth (molars and premolars) grind up and chop food.
11. Ask students to compare eating bananas with eating celery. Ask: Which is more work for your teeth? (Celery.) Guide students to the conclusion that eating tough, fibrous foods would wear down their grinding back teeth if they ate these foods every day.
12. Distribute Four Horse Teeth to students.
13. Direct students to the picture of the Equus tooth. Ask: What is the diet of modern horses? (Grass, hay.) Call on a volunteer to describe this modern horse tooth. Why do you think this tooth is so long compared to more ancient horse teeth? (Because it wears down over time from grinding tough grass.) Direct students to the picture of the Equus tooth. Ask: What is the diet of modern horses? (Grass, hay.) Call on a volunteer to describe this modern horse tooth. Why do you think this tooth is so long compared to more ancient horse teeth? (Because it wears down over time from grinding tough grass.)
14. Have students answer the questions on Four Horse Teeth.

Wrap-Up

15. When students are done, discuss what paleontologists can learn about an extinct animal by studying its bones and teeth.

Four Horse Feet Worksheet

Name: _____ Date: _____

Horse Foot Bone Fossils *SHOWN TO SCALE*

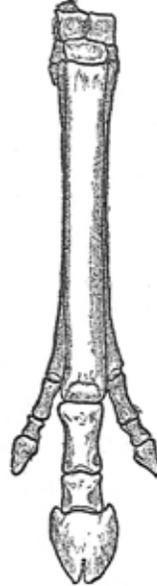
Eohippus
55 - 45 million
years ago



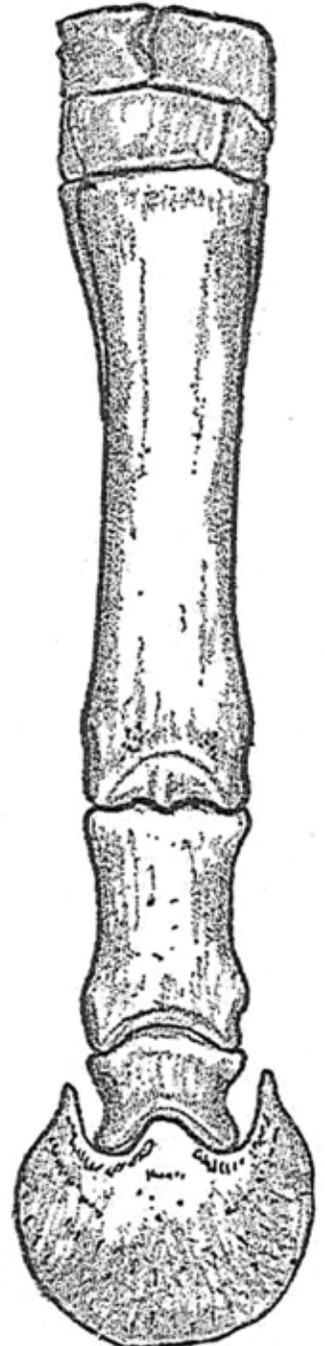
Mesohippus
33 - 29 million
years ago



Merychippus
17 - 11 million
years ago



Equus
5 million years
ago to present



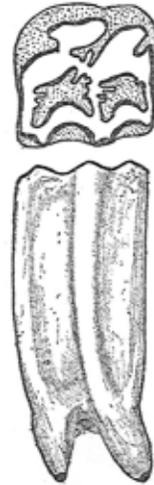
Directions

1. Observe the four sets of foot bones. Circle the hoof on each toe.
2. Write down differences you see between the four sets of foot bones.
3. How did the bones in horse feet change over time?
4. Beneath each set of foot bones, write whether you think the horse lived in forest or grasslands. Explain your choices below:

Four Horse Teeth Worksheet

Name: _____ Date: _____

Horse Tooth Fossils *SHOWN TO SCALE*



Eohippus
*55 - 45 million
years ago*

Meshippus
*33 - 29 million
years ago*

Merychippus
*17 - 11 million
years ago*

Equus
*5 million years
ago to present*

Directions

1. Observe the four teeth above. Write down differences you see.
2. How did horse teeth change over time?
3. How does the shape and size of the teeth relate to the environment that the horse lived in?