



---

## Horse Evolution Exploration Station

- This activity can be used as a “Exploration Station” activity in conjunction with the “The Evolution of the Horse” exhibit and the traveling horse exhibit coming to the NHM in 2009.
- This activity will use the existing horse exhibits to demonstrate the evolution and changes in horse feet and hooves through time.
- The docent will lead visitors in a demonstration using their hands to show the different horse feet and hooves.
- Visitors will be able to complete a take home craft activity.
- Concepts covered: evolution, environmental pressure, adaptation.

## Activity

### Introduction

- When a visitor arrives at the Exploration Station, introduce the exhibit. Encourage the visitors to study the exhibit:
  - What are some of the differences between the skeletons?
  - How was the environment different then it is now?
  - How old is the oldest skeleton?
  - How do you imagine the horse behaved then and now? For example, what would the ancient horse do if he saw a predator (probably hide), versus the modern horse (probably run).
- Point out the marked difference in the feet of the horses. The feet of the horses’ provide great insight into how the horse has evolved.
- Tell the visitors that the changes in the feet of the horses provide great insight into how the horse has evolved over time.

### Demonstration

*The following demonstration should take about 5 minutes. Ask the visitor to do a quick demonstration using their hands. This demonstration will show how horse feet have changed from 4 separate toes into a single hoof.*

## Part 1

- Start by having the visitors place their hands flat on the table top.
- Talk about how the climate of North America was when the ancestors of the horse first appeared:
  - Ancestors of the horse first appeared in North America about 55 million years ago.
  - 55 million years ago, North America's climate was a tropical rainforest. This means that there were plenty of trees and small plants.
  - Ask visitors how they think the horse ancestors might have lived in this environment
    - *What kinds of plants were present?*
    - *What kinds of foods might the horse have eaten?*
    - *What would the horses' environment have looked like?*
    - *What would the ground feel like? Hard? Soft? Mushy?*
  - Explain that these horses were well adapted to living in a forest environment.
  - This hand formation will represent the foot of the *Eohippus*, one of the earliest relatives of the horse. (60-45 million years ago)
  - *Eohippus* was only about 2 feet long and 8-9 inches tall.
  - It was an herbivore that lived in a forest habitat.
  - Since it lived in the forest, which has softer, "squishier" ground than a prairie, the *Eohippus* had soft feet with 4 toes on each foot.
  - The softer feet prevented the *Eohippus* from sinking into the soft ground of the forest. If the *Eohippus* would have had a sharp hoof, it would have sunk into the soft ground.

## Part 2

- Now talk about how the climate of North America changed about 35 million years ago.
  - Discuss how the environment of North America changed from a rainforest to a more grassland environment.
  - Some forested areas remained but a large portion of North America became grassland or prairie habitat.
  - Ask visitors what they think happened to the *Eohippuses* that lived in the forest.
    - Did they all go extinct?
    - Did they move?
    - Did they change in anyway? Adapt?
  - Explain that these forest horses changed, or "adapted" to living on the prairie.
- Now have the visitors place only 3 fingers on the table. This should cause the visitors' wrists to rise up a few inches.
  - Discuss that the hand formation represents the *Mesohippus*.
  - The *Mesohippus* was a little bigger than the *Eohippus*, standing about 2 feet tall.
  - The *Mesohippus* was a grazer that browsed on the new grasses on the prairie.

- Because of the changing climate and environments, the *Mesohippus* had evolved to have only 3 toes, and stood predominantly on its middle toe.
  - Even though *Mesohippus* evolved to only have 3 toes to accommodate the new terrain found on the prairie, they still had soft tissue, not the hard hoof seen in modern horses.
- Also mention that just like the visitors' wrists moved up in the air when they placed 3 fingers on the table, the *Mesohippus*' ankle also rose up in the air but was supported by strong ligaments and tendons connected to the toes.

### Part3

- Now introduce the evolution of the hoof in modern horses.
  - During the 24 millions years that followed, the horse continued to live in a prairie-like and grassland environment.
  - Ask visitors what they think happened to the horses to that lived in the prairie.
    - Did they all go extinct?
    - Did they move?
    - Did they change in someway? Adapt?
  - Explain that these prairie horses continued to change, or "adapt" to living on the prairie.
- Now have the visitors make a fist and place it knuckle-side down on the table. This represents the hoof of a modern day horse.
  - About 11-4 million years ago, a new horse emerged. This horse is called, *Equus*, and is known as the modern horse you know today.
  - *Equus* was about 5 feet tall and ate grass almost exclusively.
  - After living on the prairie for such a long period of time, *Equus*' foot evolved from the 3 soft toes of *Mesohippus*, to a single hoof made of hardened keratin. Keratin is the same substance that makes up your hair and fingernails.
  - The hoof of *Equus* is actually just a large flattened out middle toe. It has lost all of its other toes.
  - Because the prairie has such hard ground, the large hard hoof makes it easier to run, compared with the soft toes of the *Mesohippus*.
- Encourage the visitors to revisit their initial guesses about the different horse models:
  - Now that we know some reasons why the foot changed. Are there other changes in the horse that now make sense? For example, the legs became longer so the horse can run faster. The neck became longer so it can reach the grass on the ground.
  - How did the horse behave then and now? For example, what would the ancient horse do if he saw a predator (probably hide), versus the modern horse (probably run).

## **Take- Home Craft**(optional)

*After completing the hand demonstration with the visitors, the docent can now lead the visitors in making a take home craft. The take-home craft is a foot print of one of the Eohippus, Mesohippus, and or Equus.*

### **Materials Needed:**

Eohippus/Mesohippus/Equus feet models  
Modeling Clay  
Plastic Wrap

### **Directions**

1. (Beforehand) Separate modeling clay into appropriate amounts. Each portion should be big enough so that when flattened, the model of the horse foot will have room to be placed in the center of the clay.
2. When visitors arrive at the table, give each visitor a portion of modeling clay.
3. After passing out the clay, allow visitors to gently touch the model horse foot. During this time, remind the visitors of which horse the model is and some accompanying information (it's habitat, when it lived, how it avoided predation, likely behaviors)
4. At this time, assist the visitors to in using the horse foot model to make a foot print in the modeling clay. Be sure to be gentle with the model!
5. If possible, have previously completed foot prints of other horse feet to compare to.
6. Be sure to point out the different number of toes that touch the ground and are captured in the clay.
7. Allow visitors to wrap their foot print in plastic wrap to take home.

---

Designed by Brinley Kantorsky  
Contact Joana Ricou – [jiricou@gmail.com](mailto:jiricou@gmail.com)

*Principal funding*

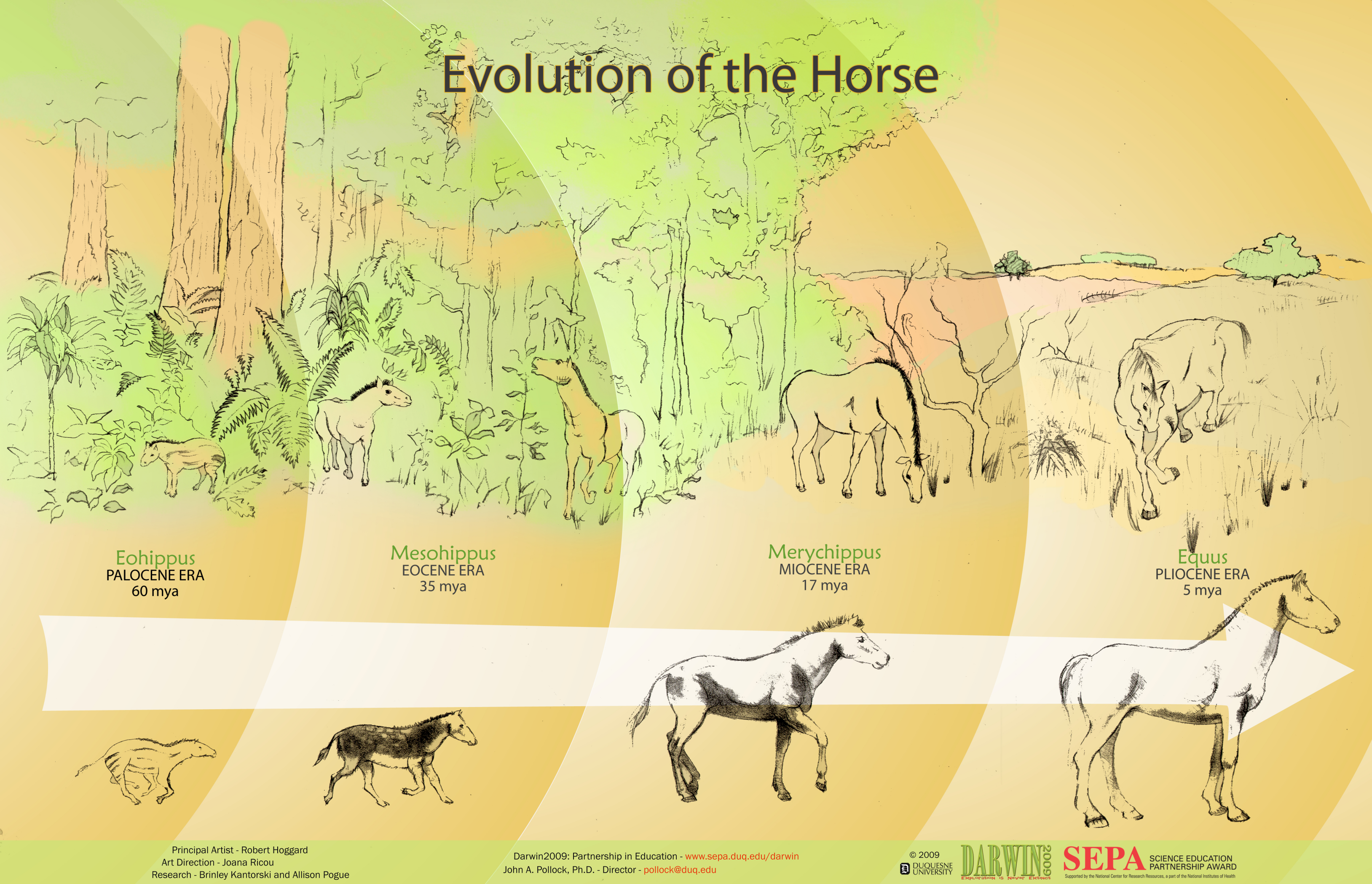
**SEPA**

SCIENCE EDUCATION  
PARTNERSHIP AWARD





# Evolution of the Horse



**Eohippus**  
PALOCENE ERA  
60 mya

**Mesohippus**  
EOCENE ERA  
35 mya

**Merychippus**  
MIOCENE ERA  
17 mya

**Equus**  
PLIOCENE ERA  
5 mya