

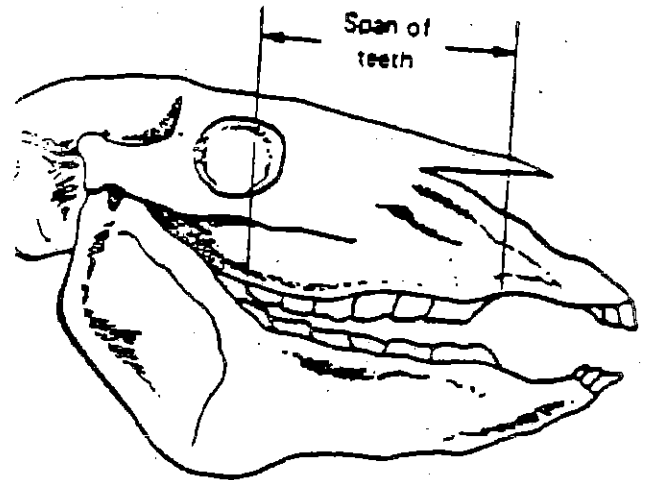
HORSES OVER TIME

Fossils represent the visible remains of prehistoric organisms. Fossils give us proof that life existed in a different form at one time.

A. LOOK MA, NO CAVITIES

Fossil evidence is rather plentiful in the case of the horse. There are fossils of horses or horse like animals as far back as 70 million years ago. The **span of the cheek teeth** has been measured in many of these fossil remains.

GROUP	TIME OF EXISTENCE MILLIONS OF YEARS AGO	SPAN OF CHEEK TEETH IN CM.
Eohippus	70	4.3
Orohippus	50	4.3
Epihippus	45	4.7
Mesohippus	35	7.3
Miohippus	30	8.3
Parahippus	30	10.0
Merychippus	15	12.5
Hypohippus	15	14.2
Pliohippus	7	15.6
Calippus	6	13.3
Equus	1	18.8



On Graph 1 in your data sheet, plot the relationship between time of existence and span of teeth.

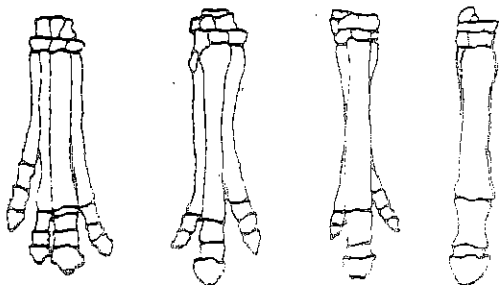
1. What has happened to the span of the horses' teeth through history?
2. Predict why the span of cheek teeth changed.

B. THEY'RE OFF AND RUNNING

Look at the diagram of the front and back hooves (toes) of these horses.

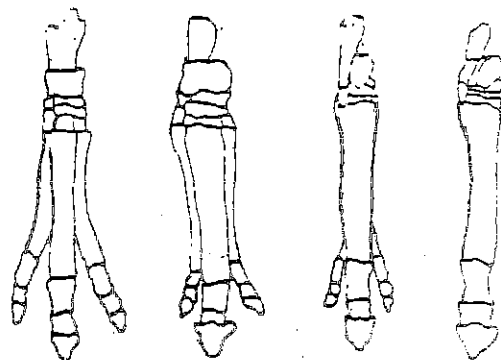
3. Which is the oldest horse and how many front and back hooves did it have?
4. How many hooves does the modern-day horse have? (count front and back)
5. Describe what has happened to the **number and size** of the hooves through time.
6. Predict the cause of the change in the hooves.

FRONT HOOVES



Eohippus Miohippus Merychippus Equus

BACK HOOVES



Eohippus Miohippus Merychippus Equus

C. NO ORDINARY SET OF BONES

Some of you may have visited a museum where sets of bones have been put together. These sets of bones may represent a kind of animal that lived at different times in history. By examining sets of fossils from different times in history, scientists can learn lots of things.

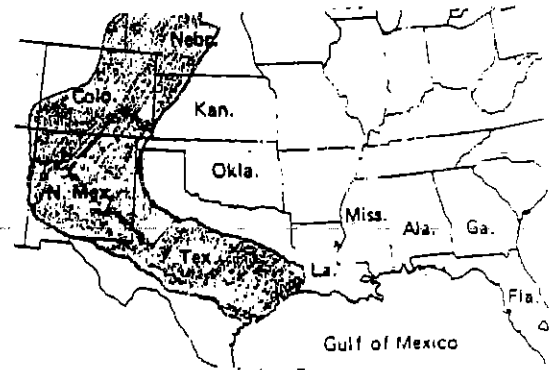
7. List 3 things scientists can tell about organisms by studying fossils.

D. AND NOW, DOWN TO TRACKSIDE

In the previous cheek span activity, you discovered that the horse slowly changed through time. There was fossil evidence to prove that the span of the cheek teeth increased and the number of toes decreased. You were also asked to **predict** why the changes took place. Now let's look at some evidence.

Eohippus, who lived 70 million years ago, was a small animal. He was no larger than a good-sized dog. His teeth were small. He had short legs with four toes on each front leg and three toes on each hind leg. He roamed the area we now call Nebraska. The Gulf of Mexico extended up into Nebraska at that time. All of Nebraska was covered by a lush forest (not anymore!).

Eohippus lived in the lush forest. The heavy foliage provided him with cover for protection and food to eat. However, as millions of years passed, the Gulf of Mexico moved farther and farther south of Nebraska, the forest changed. It began to thin out because the air was no longer as humid. *Eohippus* and his ancestors lost their forest protection.



8. How might the change in the forest effect the survival of the horse?

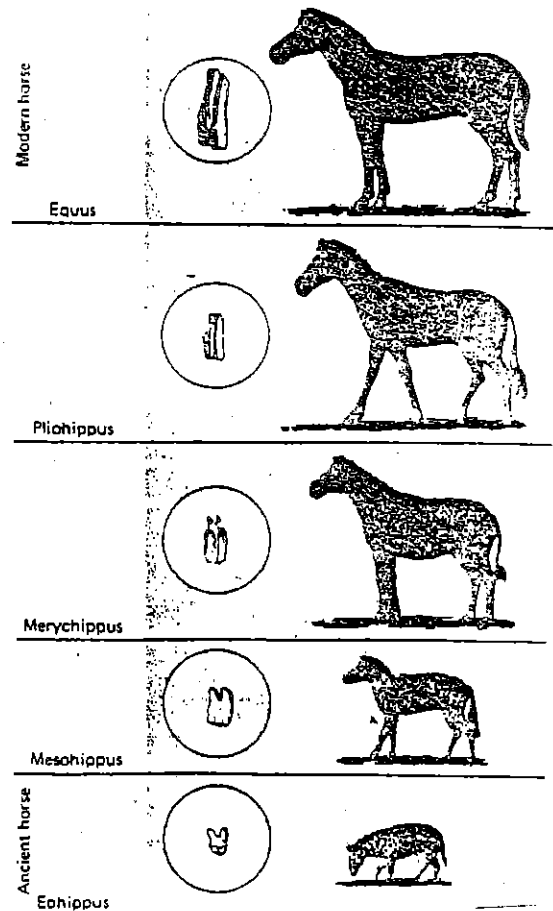
As you learned earlier, the horse has evolved from an animal with many toes to one with only one toe or hoof on each leg. In addition, the legs of horses have gotten longer.

9. In light of the environmental changes discussed previously, explain why the number of toes and the length of the legs changed through time.

In addition to losing his forest protection, *Eohippus* found a change in his diet. The supply of soft forest-type leaves was slowly replaced by harder grasses which grew where the beach used to be.

The diagram to the right shows the shape of the horses' teeth.

10. As the type of the food changed from soft to hard, which horses had a better chance of surviving? Why?
11. Describe how the teeth of the horse changed over time from *Eohippus* to *Equus*.
12. In terms of the size of teeth, what type of offspring might the surviving horses tend to have more frequently?



The horse has evolved from an animal with a smaller span of teeth to one with a larger span of teeth. The teeth themselves changed from being long and thin to short, large, and stubby. As the teeth size increase, the span of cheek teeth also increased.

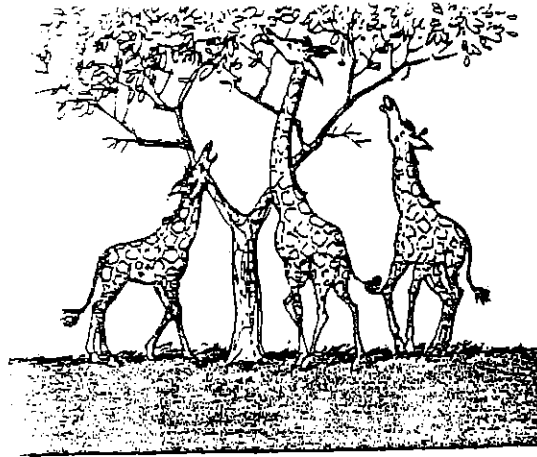
13. In light of the environmental changes discussed previously, explain why the size of the teeth and the span of the cheek changed through time.

E. WHO SURVIVES?

To summarize, you have learned that individuals differ. Because of these differences, some will have a better chance of surviving. There may be many differences that help an organism survive. A more favorable structure is not the only reason. Those organisms that survive live to give birth to young that are similar to the parents. This idea was observed, studied and proposed by Charles Darwin around 150 years ago. He called it the "Theory of Natural Selection". Some people also called it "survival of the fittest".

14. Describe what is meant by "survival of the fittest".

The drawing below shows a giraffe with a long neck munching on the leaves of a tree, while giraffes with shorter necks strain to reach the leaves. The giraffe did **not** get its long neck by stretching its neck to reach higher leaves.



15. Using Darwin's Theory of Natural Selection, how would you explain how the present day giraffe got its long neck?
16. Using Darwin's Theory of Natural Selection, explain why we have so many different kinds of living things on earth.
17. In summary, according to Darwin, which organisms survive?