

PHYLOGENY OF HORSE

*SCIENTIFIC CLASSIFICATION OF HORSE

Kingdom :	Animalia
Phylum:	Chordata
Class:	Mammalia
Order:	Perissodactyla
Family:	Equidae
Genus:	Equus
Species:	<u>E.ferus</u>
Sub-species:	E.f.caballus

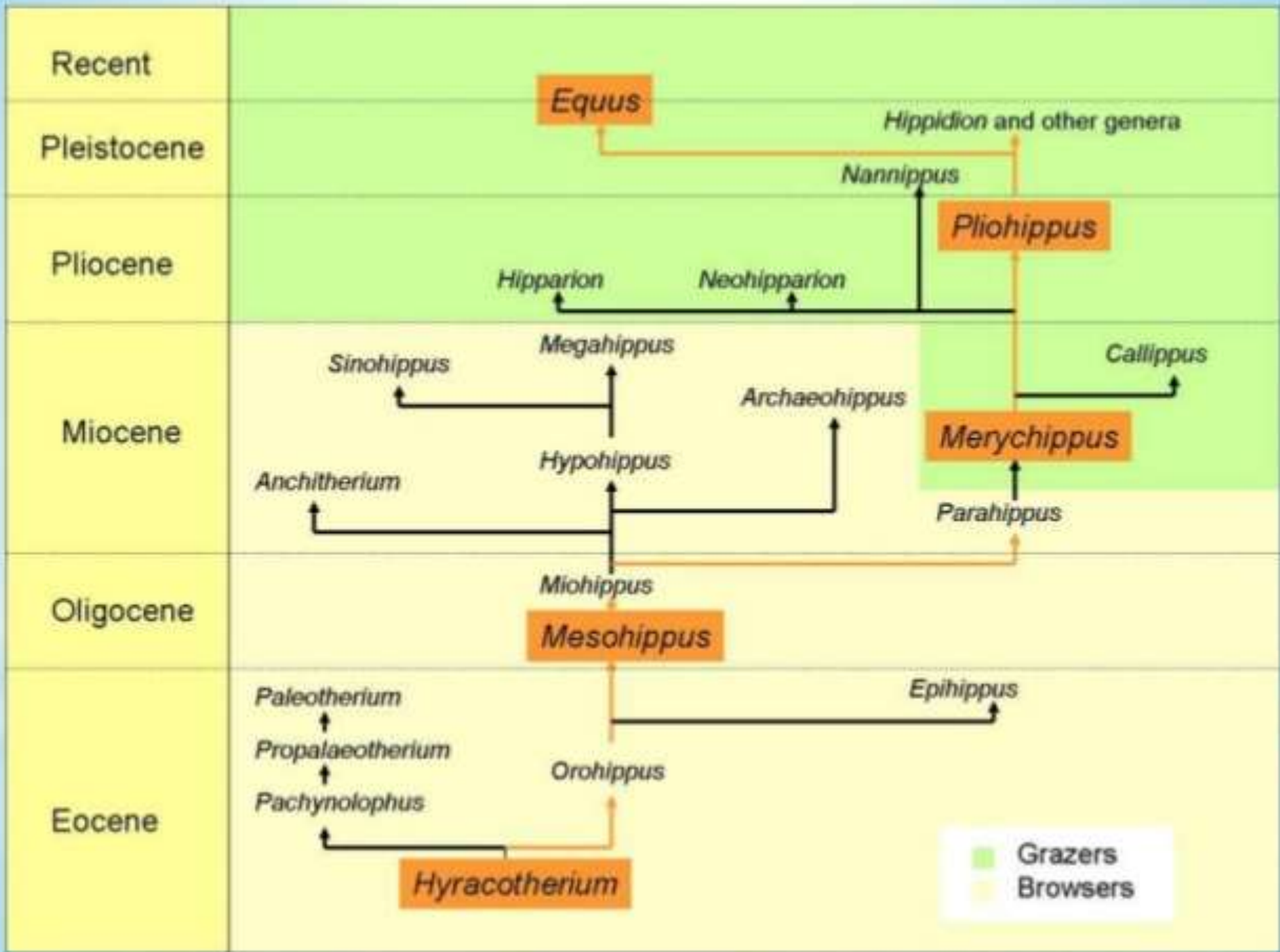
*PREHISTORIC HORSE

- The horse as we know it today is descendant from a small primitive, four toed animal.
- Prehistoric horses stood only about 4.5 feet high at the shoulder.
- Approximately fifteen million generations later, **Equus** evolved as the first "true horse"
- Equus **migrated from North America** throughout the world. Fossil remains have been discovered in Asia, Europe and Africa as well as throughout North and South America.

* Historical background

- The first Old World equid fossil was found in the gypsum quarries in Montmartre, Paris, in the 1820s. It was identified by **Georges Cuvier** who **as a browsing equine** related to the tapir.
- In the 1870's, the paleontologist **O.C. Marsh** published a description of newly discovered horse fossils from North America.
- The sequence, from *Eohippus* to the modern horse (*Equus*), was popularized by **Thomas Huxley**.

- Some years later, the American Museum of Natural History assembled a famous exhibit of fossil horses, designed to show gradual evolution from "Eohippus" (now called Hyracotherium) to modern Equus. Such exhibits focussed attention on the horse family specifically as a model of gradual, **straight-line evolution**.
- **G.G.Simpson** in 1951 first recognized that the modern horse was not the "goal" of the entire lineage of equids, but is simply the only genus of the many horse lineages to survive.



Equus (Pleistocene period)



Pliohippus (Pliocene period)



Merychippus (Miocene period)



Mesohippus (Oligocene period)



Eohippus (Eocene period)

* CHARACTERISTICS OF MODERN HORSE

- Neck and head long and slender to minimise the resistance during running.
- Skull large and **brain box spacious**
- Premolars molar-like with deep crowns and adapted for grinding.
- Feet long and one toed, i.e., unguligrade.
- **Higher sense of intelligence.**
- Radius and tibia are long while the humerus and femur are short.
- **Size of modern horse is 6' 4" at shoulder.**
- **The back is arched.**

*EOHIPPIUS (Hyracotherium) 60 million years ago.

- Known as the "dawn horse"
- size of a fox (250–450 mm in height)
- skull and neck were short. The back was arched and flexible.
- Fourlimbs & hindlimbs possessed 4 & 3 digits. The 1st & 5th digit in the hindlimbs were represented by splints.
- toes touched ground ; supported by a pad.
- Dentition- brachydont
- used to browse on soft vegetation.
- Better adapted to walk on soft floor of the forest
- The cerebral hemispheres were small and smooth.

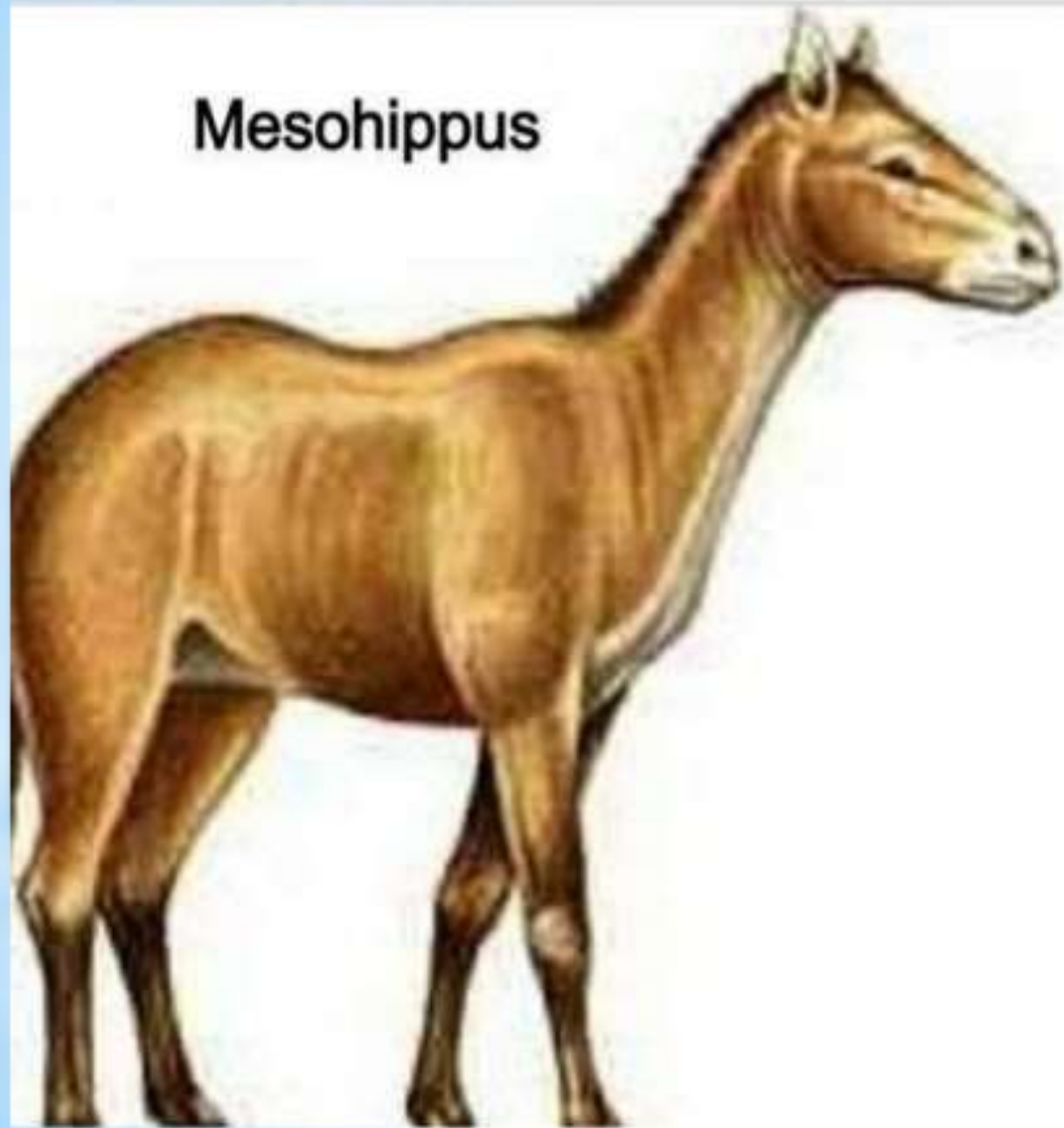


Hyracotherium (Eohippus)

*MESOHIPPUS (Intermediate horse) 35-40 million years ago.

- size of sheep (18-24 inches in height)
- Neck was short and less flexible back was more arched.
- Toes in forelimbs and hindlimbs were **reduced to 3**; 5th digit in forelimb was represented by a splint.
- toes touched the ground; middle one was larger to bear most of the body weight.
- Feet had pad under the toes showing beginning of the hoof.
- Dentition **brachydont** ; molars were still low crowned.
- forest dwelling habitat.
- Cerebral hemispheres were enlarged and convoluted, and brain had the appearance of horse brain.

Mesohippus

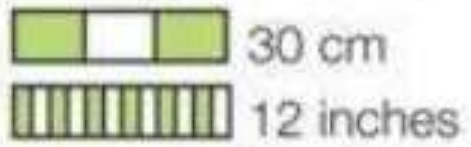
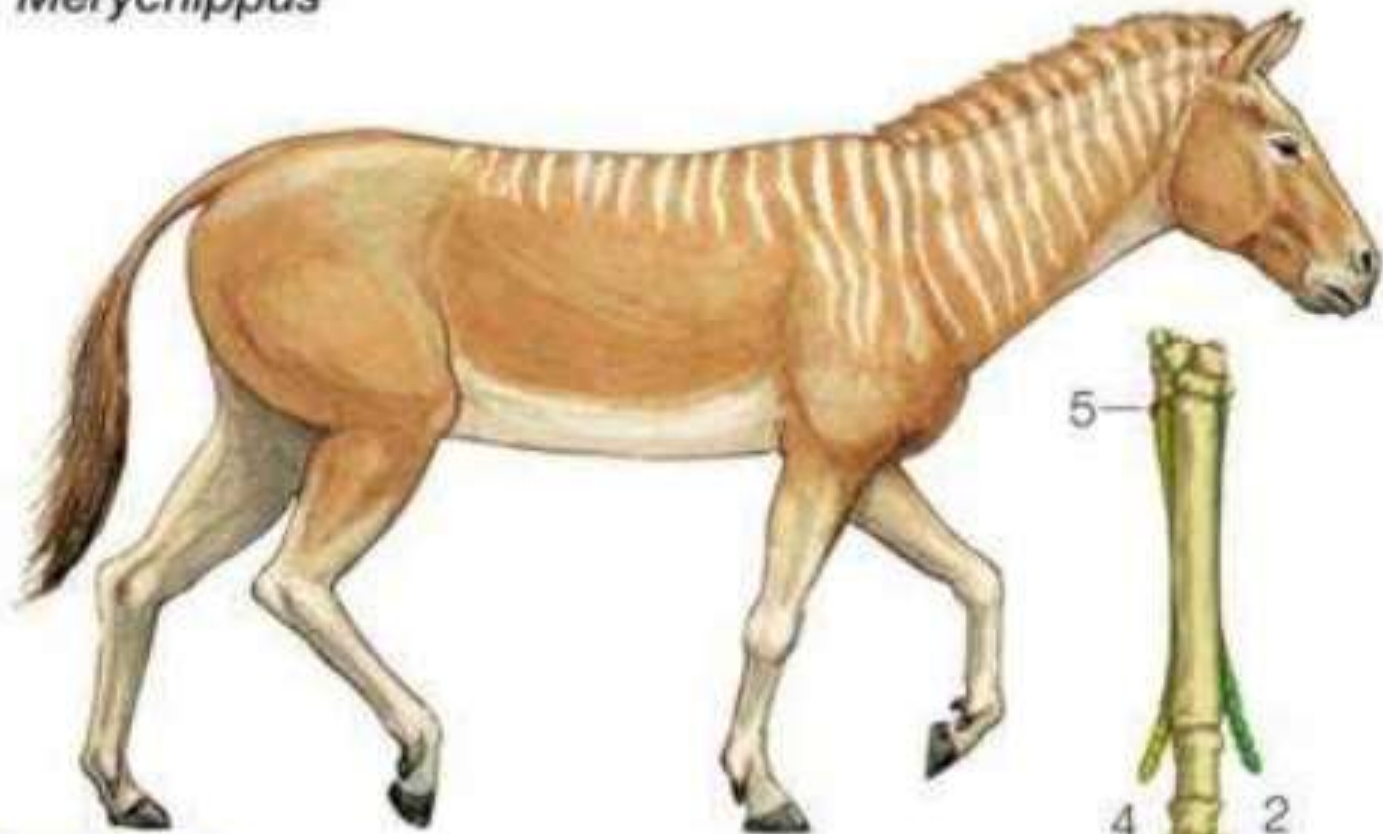


*MERYCHIPPUS (Ruminant horse)

20-25 million years ago.

- First 3-toed grazer feeding on grass and therefore marks the **transition** from primitive browsing horse to modern **grazing** horse
- Had 3 toes; but the 2nd and 4th (side toes) were reduced and did not touch the ground
- Foot pad was absent; adapted to walk on comparatively hard ground.
- Dentition was Hypsodont teeth were **high crowned**
- **Merychippus marked the complete of transition from Browsing to Grazing.**
- Cerebral hemispheres were large and convoluted with fissures, resembling that of modern horse.

Merychippus



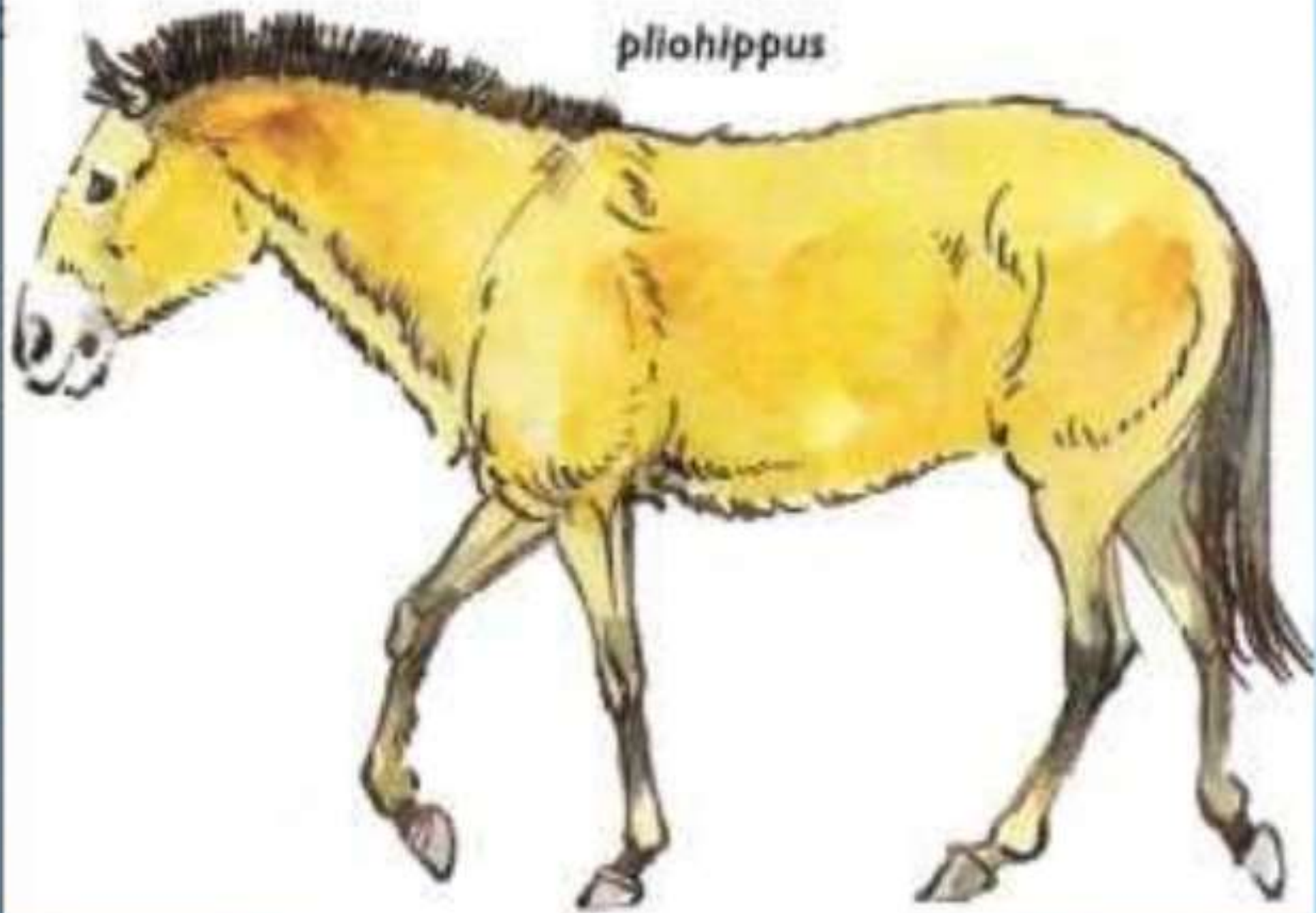
forefoot

*PLIOHIPPIUS (Pliocene Horse)

12-6million years ago

- First one-toed horse whose fossil remains are found from Miocene and Pliocene period.
- Size of modern Pony-40 inches in height; increased.
- Changes were reduction of side toes 2nd and 4th.
- Crowns of upper molar were similar to those of modern horse.
- Increase in complexity of molar teeth.
- Increase in preorbital length of skull.
- Pliohippus was succeeded by members of modern horse - Equus.

pliohippus



*EQUUS (Modern Horse)

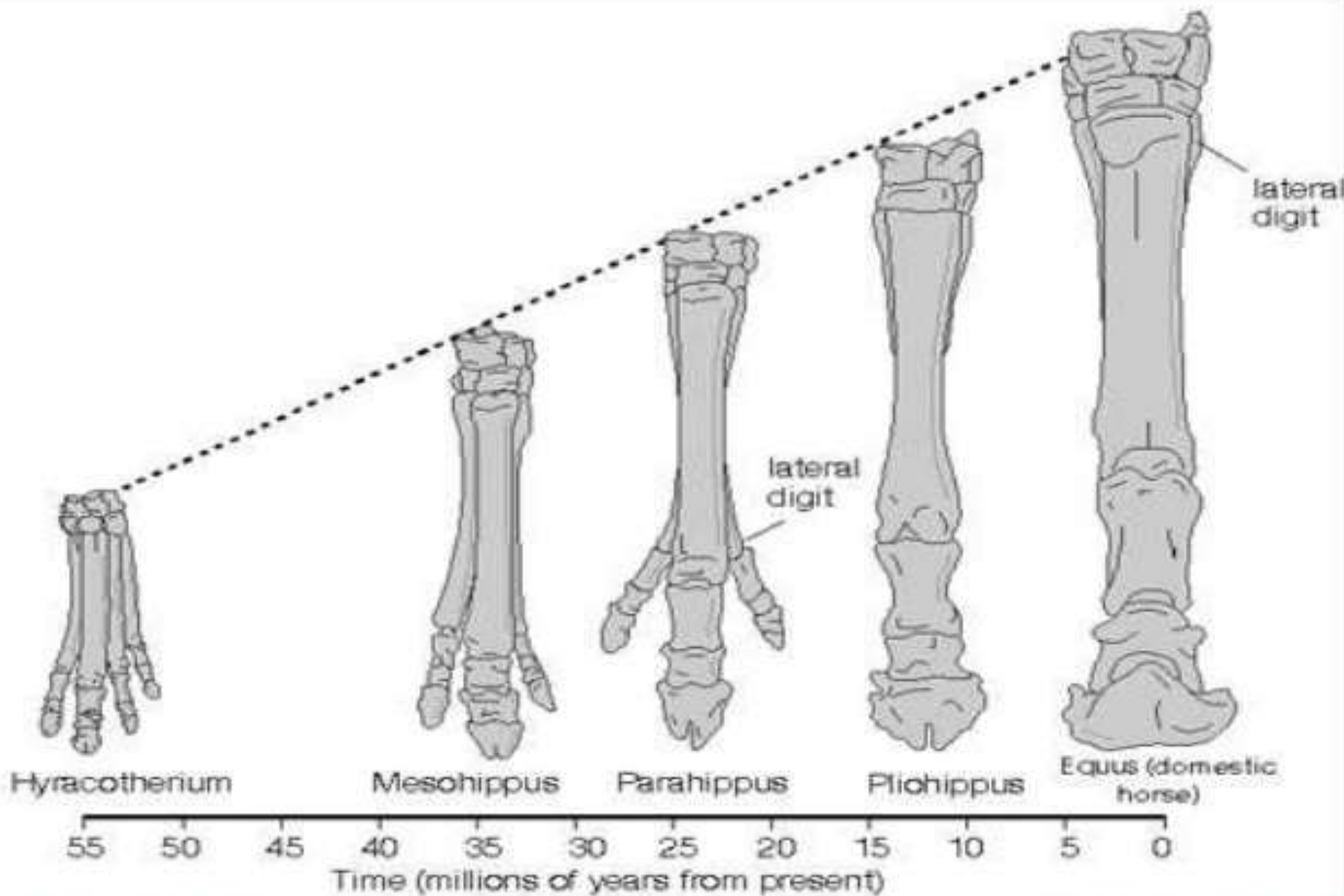
5 million year ago.

- 60 inches in height; increase in size.
- Appeared towards the end of Pliocene period
- 4th and 5th digits were entirely lost
- the 2nd & 4th digit were represented by splints, so that entire weight of body is balanced by 3rd digit alone; monodactyl.
- Crowns of molars are elongated and are adapted to feed on dry and harsh grass.
- Long-legged; swift-running animal.
- Enlarged brain and cerebral hemispheres have grooved surface.



*EVOLUTIONARY TRENDS IN HORSE

- Reduction in toes
- Elongation of legs by standing on the toes
Increased body size
- Elongation of the muzzle
- High crowned, specialized teeth



Parahippus: Miocene horse. Parahippus evolved into Merychippus.

* Environmental causes for evolutionary trends in horses

- Need for greater speed and body size to escape predators
- Cooling climate during the Cenozoic replaced forests with grasslands
- Simple hooves and elongated legs are adaptive for running in the open.
- Elongated muzzle to reach grass.
- Grasses are high in silica to which high crowned teeth are adaptive.
- High crown- so that enamel won't erode away.

*EVOLUTION IN TOOTH STRUCTURE

- Lifespan of individual is limited by length of time its teeth remain sound and useful
- Blades of grass have tiny spicules of silica . Chewing such grass quickly wears out low crowned teeth.
- Horse teeth have evolved **hypsodonty**, which means they have a **high crown**; allowing them to utilise a tougher food source
- Increased number of cusps
- **Presence of cementum increases the hardness of the tooth** and also creates ridges on the occlusal surface of the tooth, which aids in more effective grinding.
- 2 factors affect occlusal surface of tooth- structure of tooth and the degree of wear and tear.

THE EVOLUTION OF THE HORSE.

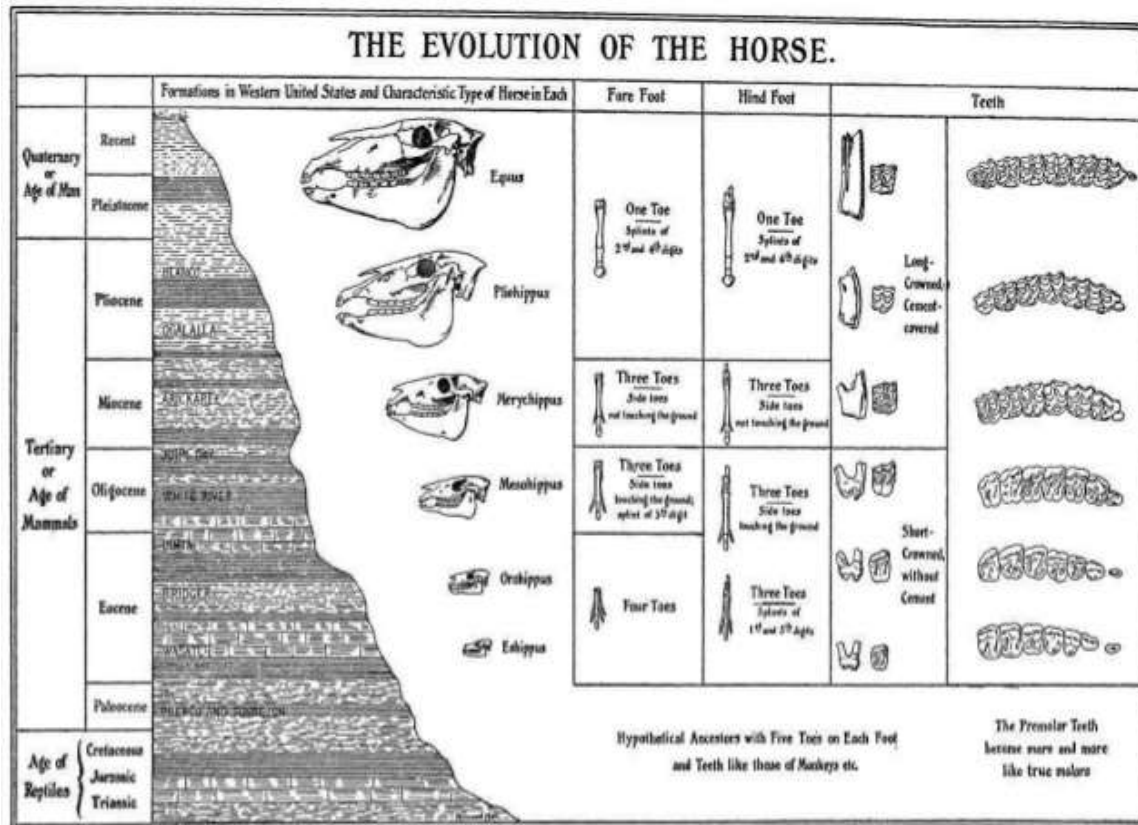


FIG. 17