

On the Origin of Perissodactyls:

An Analysis of the Evolution and Diversity of Early Odd-Toed Ungulates

During the early to middle Eocene epoch, the diversity of the order Perissodactyla significantly changed in North America. The dawn of perissodactyls occurred with the abrupt appearance of *Hyracotherium*, the most primitive member of the family Equidae (horses), at the beginning of the Eocene, 55.8 million years ago. There is no scientific consensus on the exact evolutionary relationships between *Hyracotherium* and other Eocene perissodactyls. Although the evolutionary chain is undetermined, there are clear differences in the dental morphology of the superfamilies that indicate change within the order Perissodactyla. *Hyracotherium*'s upper molars are generally cusped with a strong hypocone and weak transverse crests interrupted by the paraconule and metaconule. Tapiroidea (tapirs) is distinguished from Equidae in having upper molars with strong lophs, a convex metacone, and a lack of a paraconule and metaconule. Rhinoceroidea (rhinoceroses) have π -shaped lophs on the upper molars and a concave metacone. Because of the lophate structure, Tapiroidea and Rhinoceroidea are thought to share a common ancestor. The family Brontotheriidae (titanotheres), differing from Rhinoceroidea, Tapiroidea, Equidae, have generally low-crowned cheek teeth with a characteristic w-shaped ectoloph on the upper molars and an isolated conical hypocone and protocone. All perissodactyls are thought to be herbivorous browsers during the Eocene. The Eocene perissodactyls, with the exception of Brontotheriidae, have a skeleton adapted for running. Limbs are often elongated and specifically the joint modifications in the elbow and wrist, and ankle restrict movement to the parasagittal plane. Based on collections data analyzed by the 2013 Teen Science Scholars, perissodactyls increase in diversity but decrease as a proportion of the total mammalian fauna with time between the Wa6 (Wasatchian, late early Eocene) and Br2 (Bridgerian, early middle Eocene) ages. With the evolution of the archetypal genus, *Hyracotherium*, the order Perissodactyla has diversified and succeeded into the modern day, with the major changes involving adaptations to running and eating a diet with coarse vegetation.