

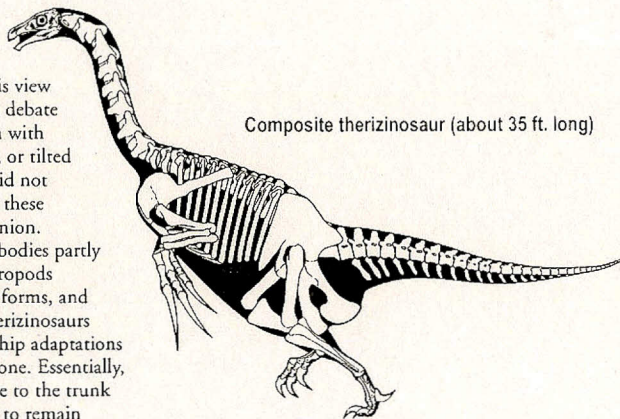
Gregory S. Paul's Dinoart Notes

Tilting Theropods And Other Dinosaurs

Theropod dinosaurs were formerly restored with a strongly erect body and dragging tail, a posture reminiscent of partly bipedal primates. Although this view has now been abandoned, there is still a debate as to whether theropods walked and ran with their bodies nearly horizontal like birds, or tilted up about 20 degrees. For some time I did not think it was possible to choose between these alternatives, but I have changed my opinion.

Some dinosaurs did carry their bodies partly erect. These include tall shouldered sauropods (camarasaurus, the long-necked Chinese forms, and especially brachiosaurs) and the odd therizinosaurs (= segnosaurus). These dinosaurs shared hip adaptations that facilitated an upwards tilted backbone. Essentially, the pelvis was rotated backwards relative to the trunk vertebrae. This allowed the hip and tail to remain horizontal while the trunk vertebrae emerged at a sharp upwards angle and carried the shoulders above hip level. This is an important because it kept the relationship between the pelvic- and tail-based muscles and the legs the same as in level-backed dinosaurs. In particular, important muscles that helped pull the leg back and propel the animal forward were anchored upon the ischia. It was important to keep the ischia far enough behind the femur so that their muscles could pull on the femur in the proper manner.

Predatory theropods did not have such retroverted hips. As in level-backed, quadrupedal dinosaurs, the trunk, hip and tail vertebrae were in much the same line. If the hips were tilted up along with the body, the ischia would have been rotated forward until they were between the legs. Some of the leg retractor muscles would have been ineffective in this position (for more details, see my *Predatory Dinosaurs of the World* 1988). This is true even of small bird-like



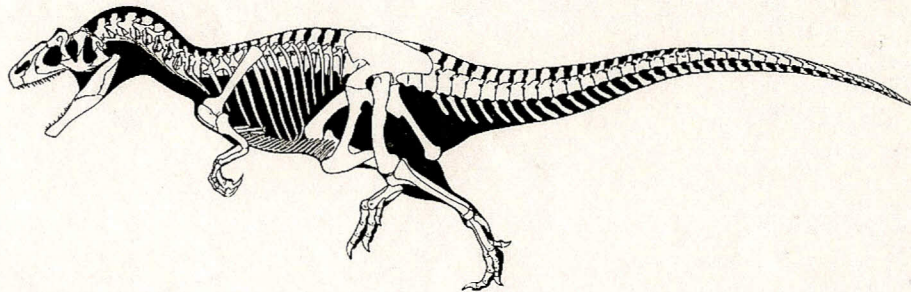
Composite therizinosaur (about 35 ft. long)

theropods that had backwards directed pubes.

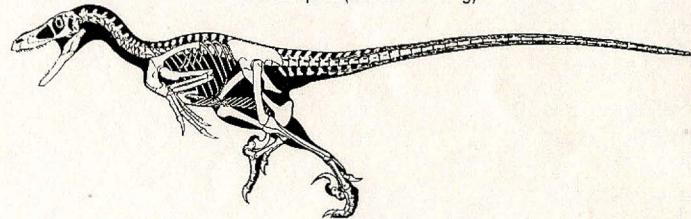
It has been argued that certain muscles that helped pull the leg forward during the recovery stroke could not work well if the theropod body was horizontal. These muscles were not as important as the propulsive ischia based muscles previously discussed, and muscles anchored on other parts of the pelvis could pull the leg forward, as they do in birds. If theropod bodies were semi-erect, they would have evolved retroverted hips and tails like tall-shouldered sauropods and therizinosaurs. That they instead had normal, level hips and tails like most other dinosaurs suggests that theropods cruised and ran with at most a slight upwards tilted body. A strongly S-curved neck carried the head high above shoulder level. When standing and walking slowly, theropods may have reared up for a better view of potential threats and prey.

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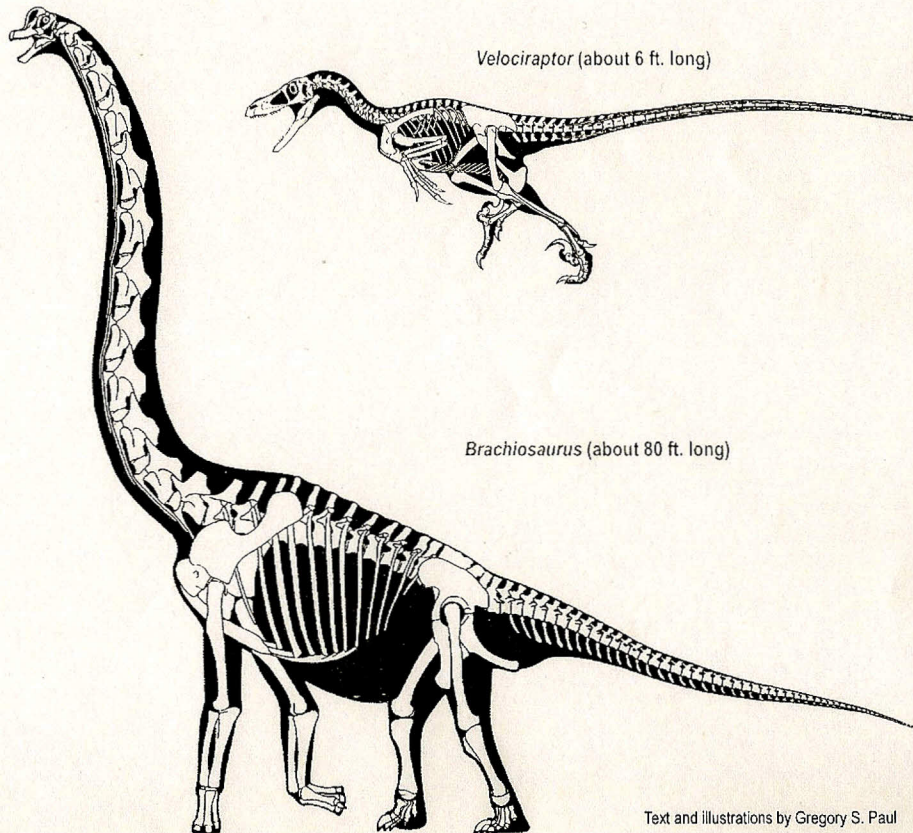
Allosaurus (about 35 ft long)



Velociraptor (about 6 ft. long)



Brachiosaurus (about 80 ft. long)



Text and illustrations by Gregory S. Paul