How Triceratops Used Its Head

Paleontology

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Among the dinosaurs the rhinoceros-like Triceratops has long perplexed ingenious palaeontologists, who have vied with each other in suggesting a use for its formidable looking head. It appears that the problem has at last been solved, and that by means which are plain and simple, when once the proper clue has been obtained. The result is that we can now form a fairly clear picture of the behaviour of the animal and of the unique means by which it contrived to secure its food.

While Triceratops was the largest of the horned dinosaurs, it had numerous relatives, which differed from it in size, in the number of horns they bore, and in other particulars of bodily conformation. All of these "Ceratopsia" were vegetable feeders. All had a narrow mouth with a parrotlike beak. The earliest and most primitive of them, obtained from the Gobi desert by the Third Asiatic Expedition of the American Museum of Natural History, were somewhat slender animals, three or four feet in length, quite hornless, but with the disproportionately large head that is so characteristic of the gigantic Triceratops. The head of all members of the group was shaped like a plowshare pointed in front and broadly expanded behind.

The great size of Triceratops suggests that it fed on abundant herbage; its primitive teeth indicate that the food was succulent rather than woody; its small mouth opening would imply that it had access to large quantities at a time. These facts in turn suggest that it was by some means able to reach the luxuriant foliage that crowned the tall fern-stems and other similar plants of the time. Its body, carried high behind and low in front, indicates that with its powerful beak it attacked the stems near their base and brought its food down from above. Its sturdy fore-limbs, carried out laterally, braced its body on either side in front. Four of its neck vertebrae were fused together into a solid horizontal post, at the end of which the great head articulated by a mobile ball and socket joint. Consequently the inference was drawn that it twisted its head sharply to one or other side, making movements like those that we make when we signify dissent.

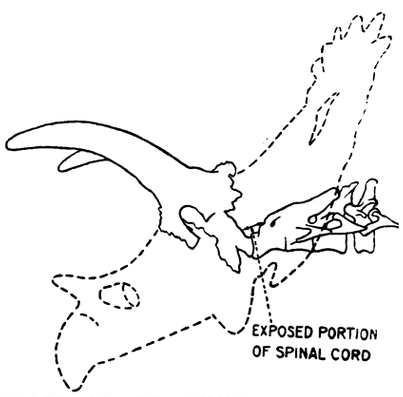
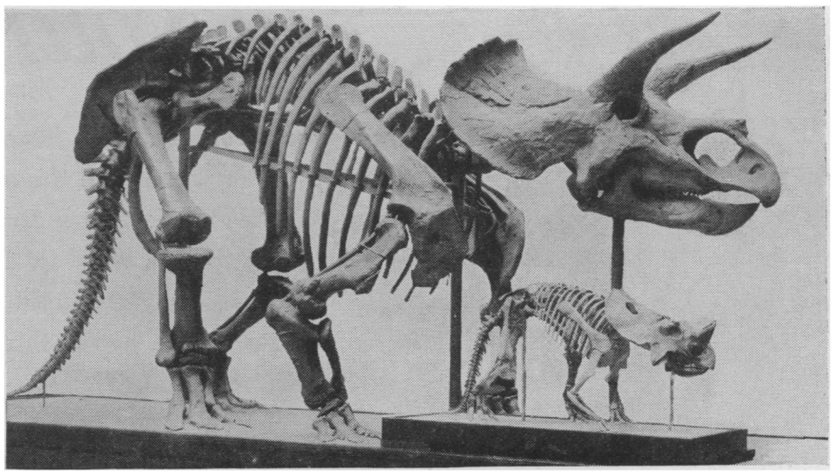


DIAGRAM OF SKULL of a horned dinosaur, by Prof. Tait and Dr. Barnum Brown, showing how the spinal cord was exposed, permitting the huge head to be turned on a stiff neck



SKELETON OF TRICERATOPS, with one of its smaller one-horned relatives from the Gobi desert, in the U. S. National Museum, Washington. Note how the front legs were braced far apart to steady the huge bulk of the monster

No living animal can thus rotate its head at the end of a neck held fixed, for the spinal cord, as it emerges from the brain, would by scissorlike action be inevitably divided by the closely contiguous rings of surrounding bone. It appears, however, that Triceratops and all its plowshare-headed relatives had a special provision to prevent this very eventuality. At its place of exit from the brain cavity, the spinal cord of these animals was for a considerable distance—almost a full foot in the case of Triceratops—quite bare of bony roof. Thus the head was free to be acutely rotated at the end of its rigid neck post. The broad skull-plate, carried in sloping direction upward and backward from the shovel-shaped snout, served two purposes. It gave an expanded attachment to the powerful rotatory and head-elevating muscles and at the same time acted as a very important shield to the unprotected region of the spinal cord. These animals were thus able to execute very bizarre movements of the head, first cocking their eye upwards somewhat like a hen viewing a hawk, but without simultaneously twisting their neck, and then drawing their beak sideways athwart the body until the other eye in turn looked upwards.

In the process of feeding, the smaller Gobi desert forms apparently plucked vegetable stems by a sharp lateral movement of the head and, continuing to maintain their hold, proceeded, like a rabbit eating a proffered dandelion leaf, to chew the whole stem from base to tip. The giant, horned forms, like Triceratops, probably went to work in rather a different way. Their business being to secure the top foliage of stouter and stronger vegetation, they probably first mowed a sheaf of fern or cycad stems by shearing each individual stem of a cluster, the nasal horn possibly being used as a rake in thrusting severed stems farther to one side.

As other features of the organization of Triceratops fit in with this conception, future illustrations of the restored animals may perhaps show them at work, with their heads twisted in extraordinary and almost comic fashion either to right or to left, seizing with their beaks the great stems of plants and forcibly mowing down swathes of lofty vegetation.

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