

## FUSED *CAMARASAURUS* CERVICALS PRESERVE AN ERECT, NOT HORIZONTAL, NECK

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Computer simulated posture of sauropod necks including *camarasaurus* is consistently horizontal. The minimal spacing between centra in these simulations is problematic. Actual neck posture is determined by a combination of bone and cartilage. The thicker the intercentra cartilage is the more dorso-flexed is the neck if the zygapophyses remain in 100% neutral articulation. In some giraffe specimens and *Camarasaurus* CM 11338 large gaps separate many cervical centra when the neck is straight and the zygapophyses are in full neutral alignment, indicating the space was filled with thick cartilage. Centra may be pulled together when the intercentra cartilage dries after death, many dorsals are jammed tightly together in CM 11338. It is simply not possible to reliably restore sauropod neutral neck posture unless the cartilage is directly preserved.

Cervicals 11 and 12 of *Camarasaurus* AMNH 5761 are fused with the zygapophyses in 100% neutral articulation. The long axes of the centra are dorso-flexed 9 degrees, it may have been higher before modest dorso-ventral crushing. Because posterior cervicals of other specimens are straight or slightly depressed when the zygapophyses are neutrally aligned and intercentra spacing is minimal, thick cartilage padding apparently was present and ossified in 5761. If *camarasaurus* normally held their necks horizontal then the two vertebrae should have fused in a straight line. That the neck base fused dorso-flexed means there were strong pressures to hold the neck erect. Sauropods had 6 or more cervo-dorsals, so 10 degrees of dorso-flexion per joint along the neck-trunk juncture would add up to 60 degrees over all. Cartilage wedging may have forced habitual erect neck posture in many other sauropods. Only some diplodocids with short necks and/or low shoulders could not readily carry the head far above shoulder level. Had Osborn and Mook, who figured the 5761 cervicals in 1921, described the flexion and used them to correctly restore an erect neck then the controversy over sauropod neck posture might never have arisen.