

What do we mean by the directions “cranial” and “caudal” on a vertebra?

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In illustrating vertebrae, it is important to consistently depict their orientation, so we can objectively assess and compare the slope of the neural arch, neural canal, or articular surfaces. However, differing vertebral shapes across taxa and across regions of the spinal column make it difficult to maintain consistency, or even define what we mean by the directions “cranial” and “caudal”. Consequently, characters such as “Neural arch slopes cranially 30° relative to the vertical” are disputable rather than objective measurements.

Cranial and caudal are defined as directed along the horizontal, but several different notions of “horizontal” are possible:

- 1. Long axis of centrum is horizontal.** This is appealing for elongate vertebrae such as sauropod cervicals, but is difficult to determine for craniocaudally short vertebrae such as most caudals.
- 2. Articular facets of centrum are vertical.** Difficult to determine when dealing with facets that are concave or (worse) convex; and ambiguous for “keystoned” vertebrae in which the facets are not parallel.
- 3. Neural canal is horizontal.** Anatomically informative, but difficult to determine in vertebrae that have not been fully prepared or CT-scanned, and impossible to see in lateral view. Ambiguous for vertebrae where the dorsal and ventral margins of the canal are not parallel.
- 4. When two instances of the vertebra are optimally articulated, the same points are at the same height on both.** This is less intuitive than definitions 1–3, but more precise and can be determined for *any* vertebra.

We advocate explicitly stating a definition and using it consistently.